QANTAS

MAINTENANCE MANUAL

CHAPTER 76

ENGINE CONTROLS

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This Table of Contents lists subjects contained in the Qantas 707-138 Maintenance Manual. Where these subjects conflict with those contained in Boeing 707 Stratoliner Maintenance Manual (Document D6-4004), the Company Manual will take precedence. Holders of Manuals when in receipt of Qantas Maintenance Manual revisions must revise the Table of Contents contained in the applicable chapter of both Manuals.



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THROTTLE SYSTEM - DESCRIPTION AND OPERATION

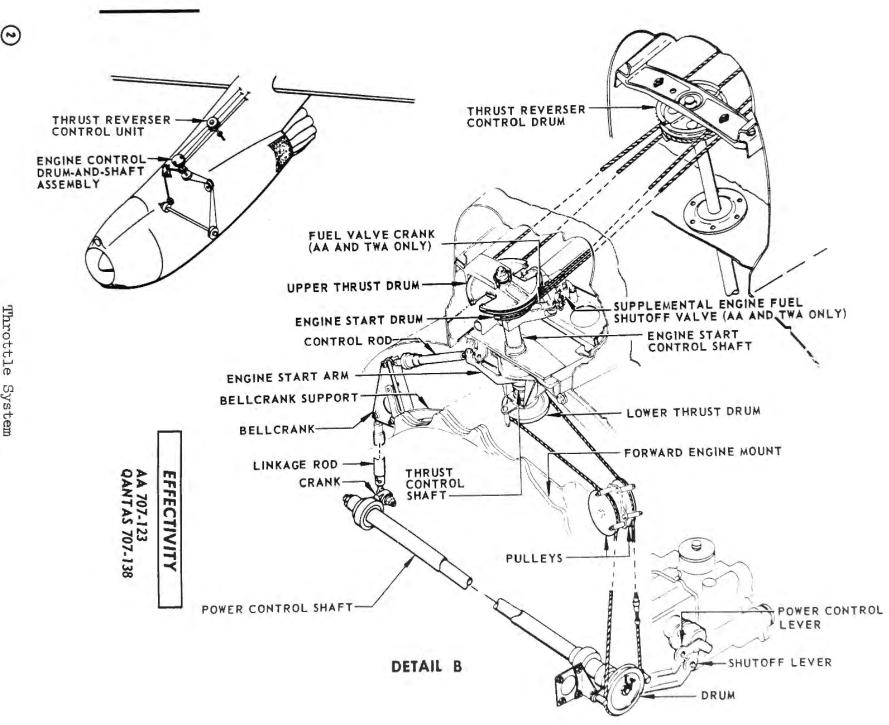
1. General

- A. A manually operated throttle system for each engine provides for separate control of engine starting and thrust. Starting of each engine is accomplished by use of a single lever to energize the ignition system and to initiate fuel flow to the engine. Another lever assembly controls both forward and reverse thrust by regulating fuel flow and actuating the thrust reverser. An interlock mechanism prevents simultaneous initiation of forward and reverse thrust for each engine.
- B. The throttle system consists of an engine start lever and a thrust lever assembly for each engine, connected by a series of throttle control cables and mechanical linkages to the fuel control units on the engines. (See figure 1.) A thrust lever friction regulator applies a braking force to all thrust lever assemblies during forward thrust operation.
- C. The engine start lever is connected by cables to an engine control drum and-shaft assembly in the nacelle strut. This control assembly is connected, by a rod-and-bell crank installation on the right side of the engine to the fuel control unit.
- D. Advancing the engine start lever actuates an ignition switch to energize the ignition system. Further movement of the start lever opens a pilot shutoff valve in the fuel control unit. On AA airplanes, the lever movement also opens a supplemental engine fuel shutoff valve in the strut.
- E. On AA707-123 and QANTAS 707-138 airplanes the thrust lever assembly is connected by cables to the thrust reverser control drum which, in turn, is connected to the drum-and-shaft assembly. A drum-and-pulley system on the left side of the engine connects the assembly to the fuel control unit.
- F. On AA707-123B and QANTAS 707-138B airplanes the thrust lever assembly is connected by cables to the drum-and-shaft assembly in the nacelle strut. The drum-and-shaft assembly is also connected to the fuel control unit by a rod-and-bellcrank installation on the right side of the engine.
- G. Actuation of the thrust lever assembly regulates fuel flow in the fuel control unit. For reverse thrust, the lever assembly movement actuates the thrust reverser before increasing fuel flow. It should be noted that the direction of travel of the thrust control cables and drums is the same for decreasing forward thrust as it is for increasing reverse thrust.

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> Description and Operation ENGINE CONTROLS Throttle System



Throttle System

Description and Operation

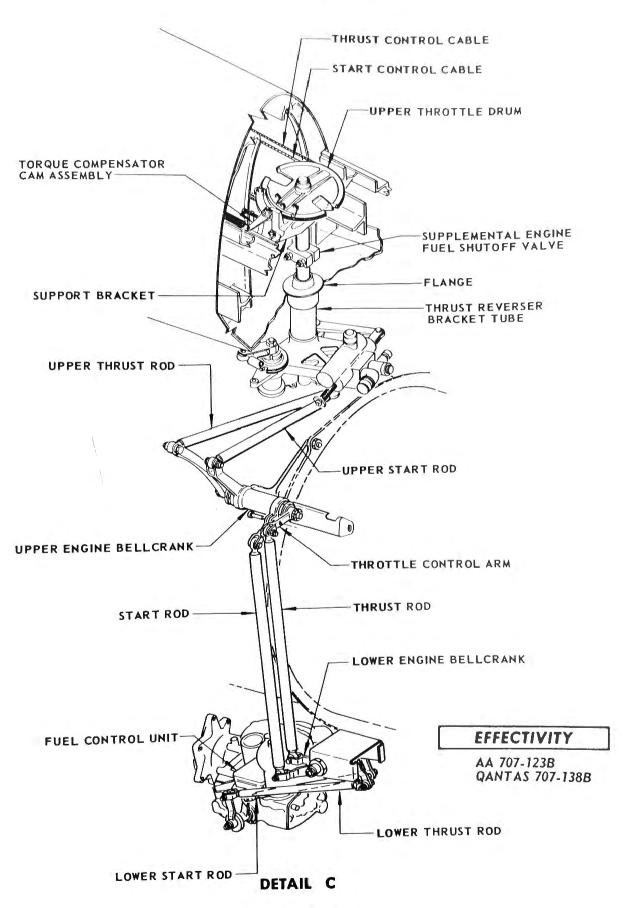
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ENGINE CONTROLS







Throttle System Figure 1 (Sheet 3 of 3)



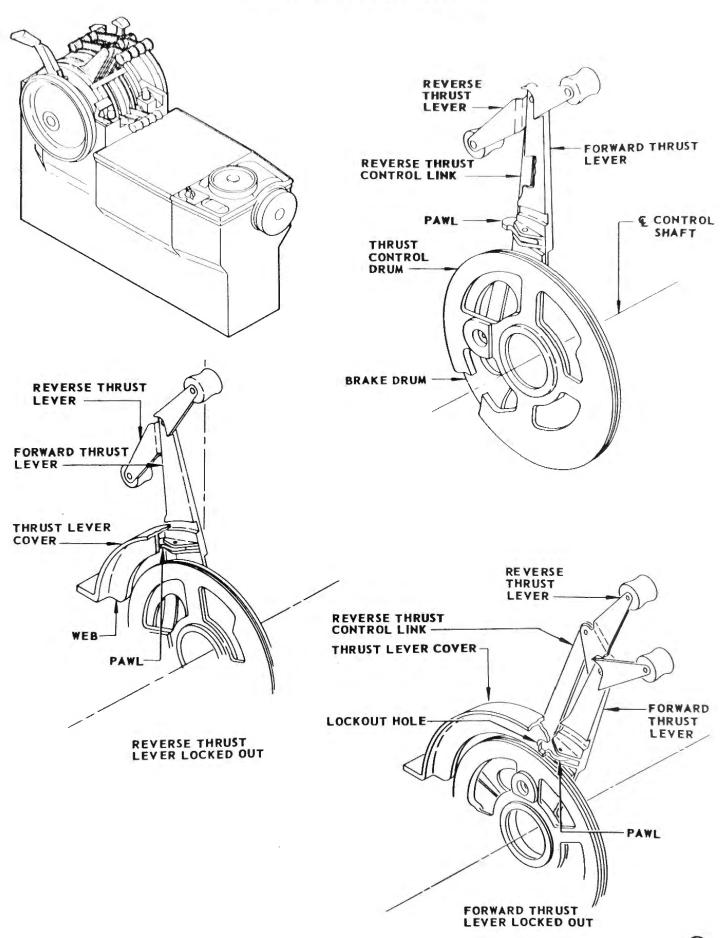
2. Thrust Lever Assembly

- A. Four thrust lever assemblies on the control stand quadrant control the forward thrust and reverse thrust of the engines. Each thrust lever assembly consists of a forward thrust lever, a reverse thrust lever, a reverse thrust control link, a pawl, a brake drum, and a thrust control drum. (See figure 2.) The forward thrust lever, with the reverse thrust lever attached to it, is mounted on the brake drum. One end of the control link is riveted to the reverse thrust lever and the opposite end is attached to the thrust control drum.
- B. As either thrust lever is advanced from the idle position, the control link rotates the thrust control drum to actuate the fuel control unit to increase thrust. The forward thrust idle position is against an idle stop on the quadrant and full forward thrust is obtained before the lever is all the way forward. The reverse thrust lever, when in the idle position, is against an idle stop on the forward thrust lever.
- C. An interlock mechanism prevents simultaneous actuation of the forward and reverse thrust levers so as to assure positive forward or reverse thrust control. The ability of each lever to move depends on the position of the other lever. If the forward thrust lever is more than two degrees from the idle position, the reverse thrust lever cannot be moved more than 12 degrees from idle. However, if the reverse thrust lever is advanced more than 12 degrees from idle, the forward thrust lever cannot be moved. The interlock between the levers is a pawl, riveted to the forward thrust lever. (See figure 2.) The pawl is between the thrust lever and the control link. When the forward thrust lever is two degrees or less from the idle position, the pawl is aligned with a lockout hole in the web of the thrust lever cover. As the reverse thrust lever is moved from the idle position, the control link forces the pawl into the hole to lock the forward thrust lever in the idle position. As the reverse thrust lever is returned to the idle position the control link pushes the pawl from the hole to unlock the forward thrust lever. When the forward thrust lever is more than two degrees from the idle position. the pawl is not aligned with the lockout hole. The web then opposes the force of the control link on the pawl so that the reverse thrust lever cannot be moved more than 12 degrees from idle.
- D. On AA 707-123B and QANTAS 707-138B airplanes a torque compensator cam assembly is installed on the upper throttle drum in the nacelle strut. (See figure 1.) The cam is designed to increase the reverse thrust lever forces to counteract the negative torque of the fuel control unit shaft, reducing the probability of the thrust system creeping toward the full reverse thrust position.

3. Engine Start Lever

A. Four engine start levers on the control stand quadrant are used to start engines. Each lever controls energizing the ignition system and initiating fuel flow to the respective engine. The start lever is provided with a spring-loaded detent catch which may be released by





Thrust Lever Assembly
Figure 2

Aug 15/60 Revised



lifting the knob. The detent secures the lever in the "CUTOFF" and "IDLE" positions. An additional detent is provided between the "CUTOFF" and "IDLE" positions. This catch is to insure that a throttle left insecurely in the "IDLE" position will not creep to the "CUTOFF" position causing an unintentional engine shutdown. A stop gate and detent is provided at the "START" position.

4. Throttle Control Cables

A. Throttle control cables consist of engine start and thrust cables which connect the fuel control unit on each engine to the respective engine start lever and thrust lever assembly. The cables are routed under the floor from the control stand through the lower nose compartment and above the forward cargo compartment ceiling. (See figure 1.) From the cargo compartment, the cables are routed along the wing leading edge to the nacelle struts. In each strut on AA 707-123 and QANTAS 707-138 airplanes the thrust cables are routed to the thrust reverser control unit, then to the engine control drum-and-shaft assembly, and finally to a drum on the power control shaft. The drum is linked to the fuel control unit. In each strut, the start cables are routed to the drum-and-shaft assembly which, in turn, is linked to the fuel control unit. On AA 707-123B and QANTAS 707-138B airplanes the thrust and start cables are routed directly to the drum-and-shaft assembly which, in turn, is linked to the fuel control unit.

5. Thrust Lever Friction Brake

- A. A thrust lever friction brake on the control stand quadrant applies a variable braking force to all thrust levers during forward thrust operation. (See figure 1.) The friction regulator is used to manually select the proper amount of braking force to prevent throttle creep during flight. The friction regulator consists of a brake handle mechanically linked to two leaf springs and four brake shoes.
- B. The brake handle, mounted to the right of the thrust levers, is connected by a brake link and an eye bolt to a brake crank. Bolted to the crank are the leaf springs and the brake shoes. As the brake handle is advanced, friction between the brake shoes and the brake drums is increased. A ratchet locks the brake handle in any position.

6. Engine Control Drum-and-Shaft Assembly

A. An engine control drum-and-shaft assembly in the nacelle strut of each engine is a mechanical link in the throttle system which provides for independent control of the fuel control unit by the thrust and engine start levers.



- B. On AA 707-123 and QANTAS 707-138 airplanes the drum-and-shaft assembly consists of concentric engine start and thrust control shafts, two thrust drums, an engine start drum, and an engine start arm. (See figure 1.) The start drum and the start arm are mounted on each end of the engine start shaft. The thrust drums are mounted on each end of the thrust control shaft which is inside the start shaft. The assembly is supported by a bracket on the strut aft of the forward engine mount. A boss on the start arm contacts a lug on the bracket to provide a mechanical stop for the engine start control system at "CUTOFF." A boss on the lower thrust drum provides a stop for the thrust system at 100% forward thrust.
- C. On AA 707-123B and QANTAS 707-138B airplanes the drum-and-shaft assembly consists of concentric engine start and thrust control shafts, a thrust control drum, engine start drum, engine thrust control crank, and an engine start crank. (See figure 1.) The start drum and the start crank are mounted on each end of the engine start shaft. The thrust drum and thrust crank are mounted on each end of the thrust control shaft which is mounted inside the start shaft. The assembly is supported by a bracket on the strut aft of the forward engine mount. The start lever contacts the strut bracket to provide a mechanical stop for the engine start control system at "CUTOFF." A lug on the strut bracket provides a stop for the thrust system at both 100% forward and reverse thrust.
- D. On AA airplanes a crank for the supplemental engine fuel shut-off valve is mounted on the engine start shaft. (See figure 1.) Rotation of the shaft causes the crank to actuate the shutoff valve arm which opens the valve.

7. Operation

- A. Advancing the engine start lever to the "START" position causes a start control cable cam to actuate an ignition switch in the lower nose compartment. The lever movement also rotates the engine start control shaft which rotates the engine start arm. On AA 707-123 and QANTAS 707-138 airplanes motion of the arm actuates the bell crank to rotate the power control shaft. Rotation of the power control shaft opens a pilot valve in fuel control unit to initiate fuel flow. On AA 707-123B and Qantas 707-138B airplanes motion of the engine start crank is transmitted through a bellcrank assembly to the fuel control unit. On AA airplanes, rotation of the engine start control shaft opens the supplemental engine fuel shutoff valve before the pilot valve opens.
- B. Placing the start lever in "IDIE" de-energizes the ignition system. When the lever is returned toward the "CUTOFF" position, the engine start arm in the drum and shaft assembly contacts the support bracket to stop the system motion at the strut. About 4° of

additional start lever motion is required to enter the "CUTOFF" detent. This stretches the control cable and insures sufficient torque at the fuel control unit shutoff lever for positive cutoff.

- C. Advancing the forward thrust lever from the idle position, locks the reverse thrust lever in idle and rotates the thrust control shaft. As the shaft rotates, the motion is transmitted to a lever on the fuel control unit. This lever rotates to increase fuel flow to the burners. On AA 707-123 and QANTAS 707-138 airplanes forward motion of the forward thrust lever is terminated by the boss on the lower thrust drum. On AA 707-123B and Qantas 707-138B airplanes forward motion of the forward thrust lever is terminated by a lug on the strut bracket. On the No. 3 engine, forward motion of the forward thrust lever causes a thrust control cable cam to actuate the flap and speed brake and stabilizer trim warning switch in the lower nose compartment.
- D. As the forward thrust lever is returned to the idle position, fuel flow is reduced and a thrust control cable cam actuates the landing gear warning switch. The reverse thrust lever is unlocked.
- E. On AA 707-123 airplanes and Qantas 707-138 airplanes advancing the reverse thrust lever from the idle position locks the forward thrust lever in the idle position. The reverse thrust control drum and the thrust control shaft rotate. On AA 707-123B airplanes and Qantas 707-138B airplanes as the shaft rotates, fuel flow in the fuel control unit is increased. When the reverse thrust lever is approximately 60 degrees from idle, the lever cannot be further advanced until the thrust reverser clamshell doors are closed. Movement of the reverse thrust lever is terminated by the follow-up control stop on the thrust reverser control unit. Rotation of the clamshell doors aft removes the follow-up stop and allows lever motion to continue to full reverse thrust.
- F. As the reverse thrust lever is advanced from the idle position, the forward thrust lever is locked out. The thrust control drum on the engine control drum and shaft assembly is rotated causing the thrust reverser main valve actuating cam to be rotated. This cam will continue to rotate with increased travel of the reverse thrust lever until it contacts the fan and aft thrust reverser locking cams. The locking cams are contacted at about one fourth of full reverse thrust lever travel. Further increase in reverse thrust is prevented at this point until both the fan and aft thrust reversers move aft to the closed position. Closing of the thrust reversers causes the thrust reverser control locking cams to be repositioned and frees the reverse thrust lever for travel to the full reverse thrust position. Under normal operation only a slight delay in lever operation will be experienced when the reverser thrust lever contact the locking cams. See Chapter 78, "Thrust Reverser Control System."

ENGINE CONTROLS Throttle System Description and Operation

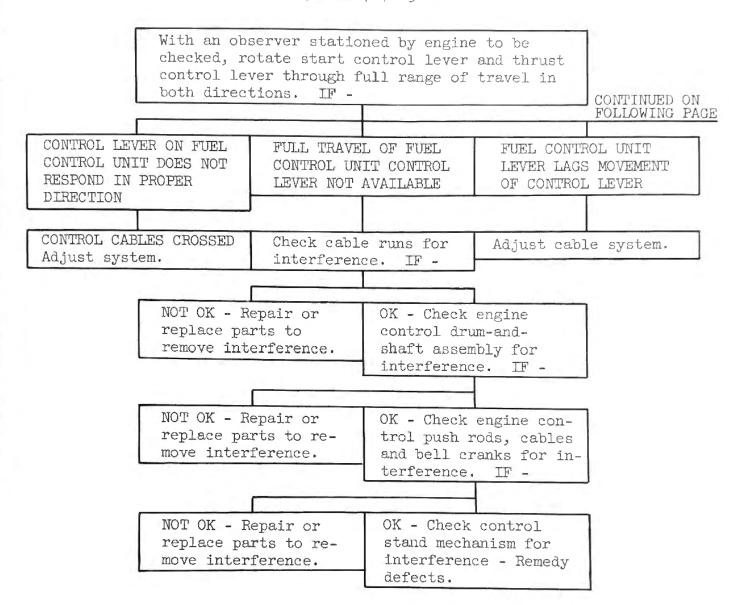
G. As the reverse thrust lever is returned to the idle position, the clamshell doors are rotated outboard and forward and the forward thrust lever is unlocked. If the clamshell doors do not open, forward motion of the forward thrust levers is blocked at approximately 3° from idle by the follow-up control stop.

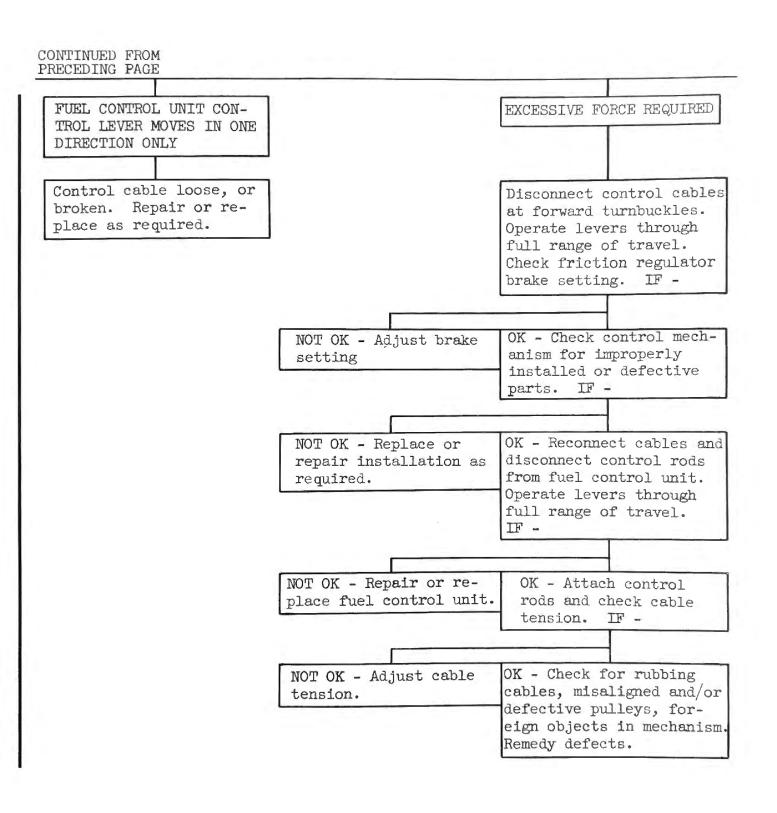
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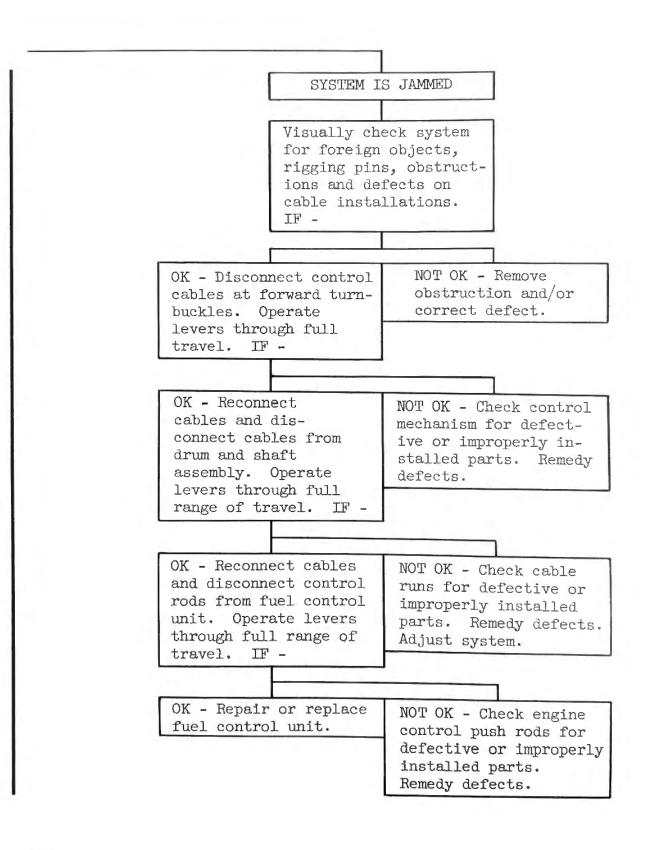
THROTTLE SYSTEM - TROUBLE SHOOTING

EFFECTIVITY

AA 707-123B QANTAS 707-138B









THROTTLE SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Throttle System

A. General

- (1) When performing adjustment/test, the throttle system for each engine is divided into two parts: the thrust system and the engine start control system. Each part is adjusted separately. Rigging pins are inserted at various points to isolate sections of each system to facilitate rigging. Cables in each section must be rigged to an equal load so that proper adjustment will be maintained after rigging pin removal.
- (2) The thrust system is adjusted to synchronize forward thrust lever and reverse thrust lever movements with engine thrust variation. On AA 707-123 and QANTAS 707-138 airplanes the system is rigged from the control stand to the thrust reverser control unit. Then the system is rigged from the thrust reverser control unit to the engine control drum-and-shaft assembly. On AA 707-123B airplanes and Qantas 707-138B airplanes the system is rigged from the control stand directly to the engine control drum-and-shaft assembly. Finally, the thrust system is rigged from the drum-and-shaft assembly to the fuel control unit on the engine. (See figure 201.)
- (3) The engine start control system is adjusted to synchronize engine start lever movement with ignition and fuel flow initiation. The system is rigged from the control stand to the engine control drumand-shaft assembly. (See figure 201.) Next, the system is rigged from the drum-and-shaft assembly to the fuel control unit on the engine. On AA airplanes, the supplemental engine fuel shutoff valve is also rigged.
- (4) When new cables are installed the initial yield must be taken up before the control cables are rigged to normal operating tension. Rig new cables to 100 pounds and cycle the system 25 times without lockwiring cable turnbuckles. After cylcing reduce cable tension to the appropriate tension for ambient temperature per table on figure 201, and lockwire turnbuckles.

CAUTION: DO NOT ATTEMPT TO OPFRATE CONTROLS WITH RIGGING PINS INSTALLED.

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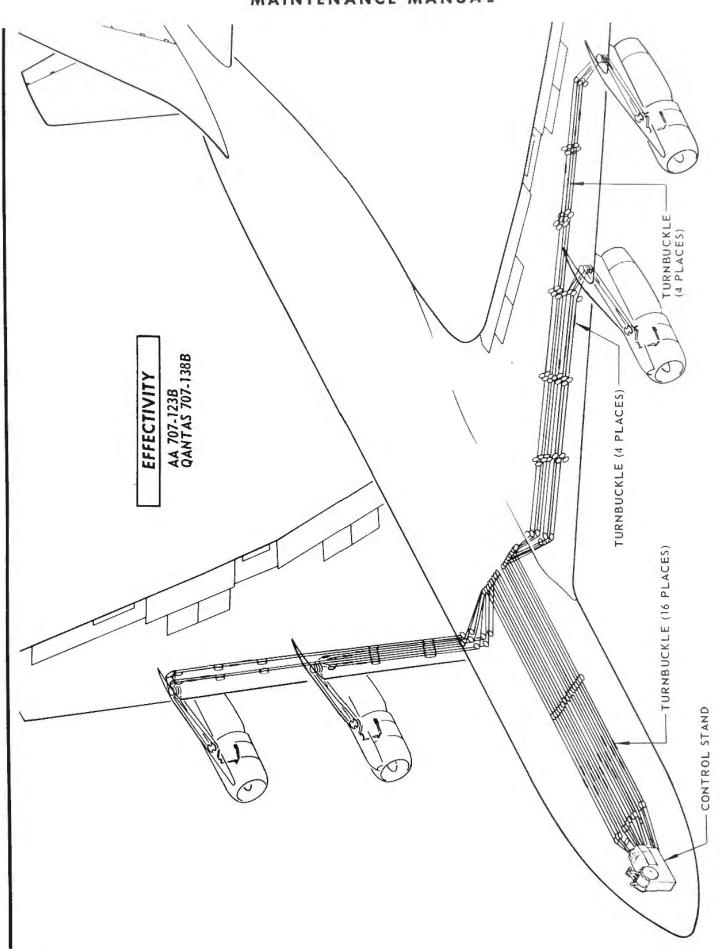
2 AA N7511A AND ON

QANTAS VH-EBA AND ON

	TEMPERATURE (degrees fohrenheit)	CABLE RIGGING LOAD • (pounds ±5)	CABLE RIGGING LOAD (POUNDS ± 5)
	110 90 70 50 30 10 -10 -30	70 60 50 42 34 27 23 21 20	51 45 40 34 26 16 10 9
CONTROL STAND	TURNBUCKLE	(4 PLACES)	
TURNBUCKLE (4 P	CONTROL -	THRUST REVE CONTROL UNI TURNBUCKLE (2 PLACES	RSER T
TURNBUCKLE (16 PLACES) AA N7501A THRU N7510A		EFFECTIVITY AA 707-123 QANTAS 707-138	







Q Aug 15/60 Revised Throttle System Adjustment Figure 201 (Sheet 2 of 2)

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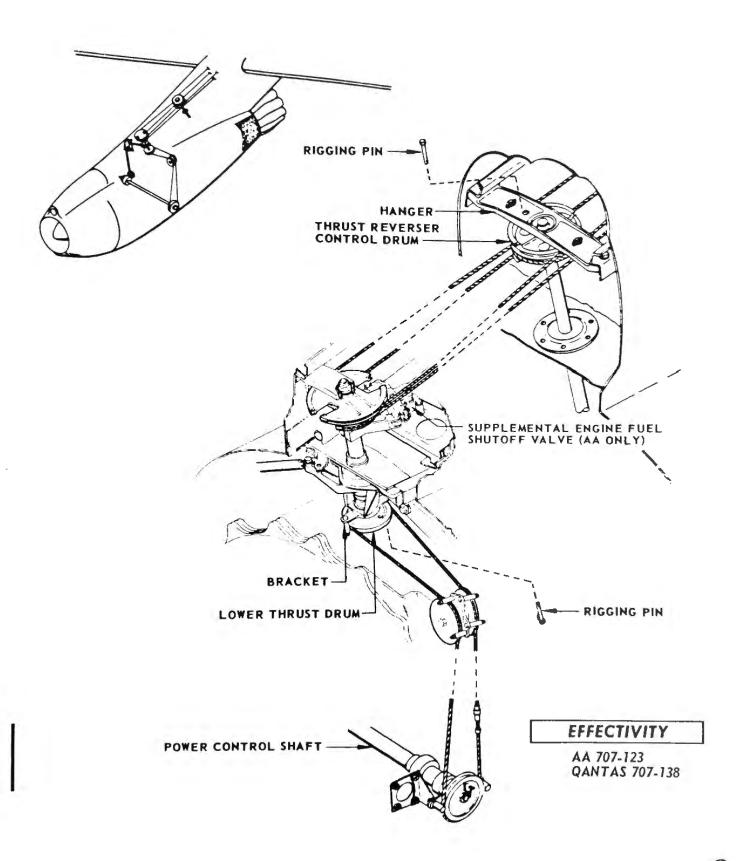
B. Equipment and Materials

- (1) Throttle Warning Horn Protractor Assembly F70024 or equivalent
- (2) Reverse Thrust Lever Protractor Assembly F70044 or equivalent
- (3) Leading Edge Flap Tock Assemblies F70064, -500, -501, or equivalent
- (4) Fuel Regulator Control Gage Assembly F70127 (AA 707-123B, and QANTAS 707-138B airplanes only)
- (5) Throttle Rigging Lock Assembly F70084 or equivalent
- (6) Fuel Control Gage Assembly F70102
- (7) Tensiometer 0 to 100 pound capacity
- (8) Spring scale
- (9) Air pressure source that can be regulated from 0 to 50 psi gage pressure.
- (10) Spacer 0.092 inches
- (11) Spacer 0.41 inches
- (12) Rigging pins MS20392-4 or equivalent.
- C. Adjust Throttle System
 - (1) Adjust Thrust System (AA 707-123 and QANTAS 707-138 airplanes)
 - (a) Position and lock thrust levers in idle no load position.
 - 1) Place 0.092 inch spacer against idle stop on control stand.
 - 2) Move forward thrust lever against spacer.
 - 3) Clamp thrust lever against spacer.
 - 4) Position reverse thrust lever against idle stop on forward thrust lever.
 - (b) Remove engine left cowl panel.

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- (c) Insert rigging pin or AN5 bolt through bracket and lower thrust drum on engine control drum-and-shaft assembly. [Hee figure 202.]
- (d) Remove nacelle strut access panel No. 740 (for outboard engine) or No. 705 (for inboard engine). See "Access Loors and Panels," Chapter 12.
- (e) Remove nacelle strut access panel No. 742 (for outboard engine) or No. 708 (for inboard engine).
- (f) Insert rigging pin or AN5 bolt through the thrust reverser control drum and hanger. (See figure 202.)
- (g) For outboard engine, lower leading edge wing flaps for turnbuckle access.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."
 - 3) Install leading edge flap down locks.
- (h) For inboard engine, remove wing leading edge access panel No. 304 for turnbuckle access.
- (i) Adjust turnbuckles in wing leading edge to rig cables to load specified in figure 201. Use tensiometer to measure rigging load.
 - NOTE: If turnbuckle travel is insufficient for complete adjustment of cable tension, further adjustment is possible by use of turnbuckles in lower nose compartment and forward cargo compartment. Access in cargo compartment is provided by removal of ceiling. See Chapter 25, "Forward Cargo Compartment."
- (j) Adjust turnbuckles in strut to rig cables from thrust reverser control unit to engine control drum-and-shaft assembly to load specified in figure 201.
- (k) Remove rigging pins.
- (1) Remove spacer from control stand.
- (m) Remove leading edge flap down locks.





Thrust System Adjustment Figure 202

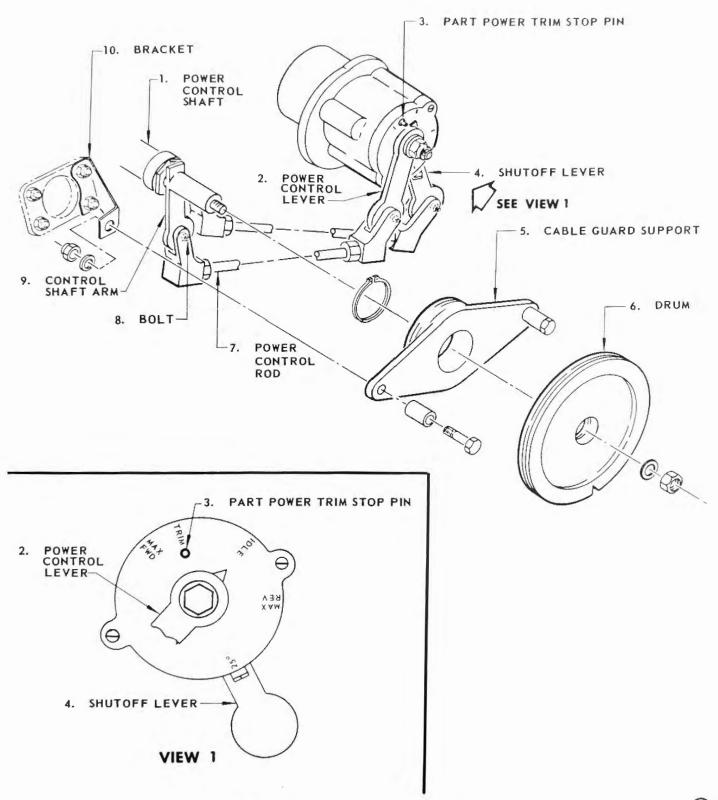
- (n) Raise wing flaps.
- (o) Depressurize utility hydraulic system.
- (p) Mount throttle rigging lock assembly on control stand.
- (q) Position forward thrust lever against spacer clamp.
- Install cable guard support (5, figure 203) on power control shaft (1) and attach to bracket (10).

CAUTION: ASSEMBLY OF MATING SURFACES OF CABLE GUARD SUPPORT AND BRACKET MUST BE FLUSH. IF GAP EXISTS, AN AXIAL LOAD COULD BE IMPOSED ON POWER CONTROL SHAFT, CAUSING EXCESSIVE FRICTION AND BINDING.

If gap exists between mating surfaces of cable guard support and bracket, shims are to be added prior to assembly of attaching bolt.

- Install drum (6) on power control shaft (1) so that notch in rim of drum aligns with center of bolt through control shaft arm (9).
- (t) Adjust power control rod (7) so that its length is equal to center distance between power control shaft and engine fuel control shaft within ± 0.03 inch. Use fuel control gage assembly for measuring distance.
- Take part power trim stop pin from stowed position and install in engine fuel control unit.
- Rotate power control lever (2) against part power trim stop pin (3). Hold against pin until completion of stop "(v)".
- Power control lever should be 56° (±1°) with reference to engine centerline. If not position lever using vernier spline adjustment on fuel control unit. Use fuel control gage assembly to obtain angle.
- Position forward thrust levers 44° 42' (± 1/2°) from the idle stop. Clamp all four thrust levers in exact alignment at this angle. Use throttle rigging lock assembly to position thrust levers.





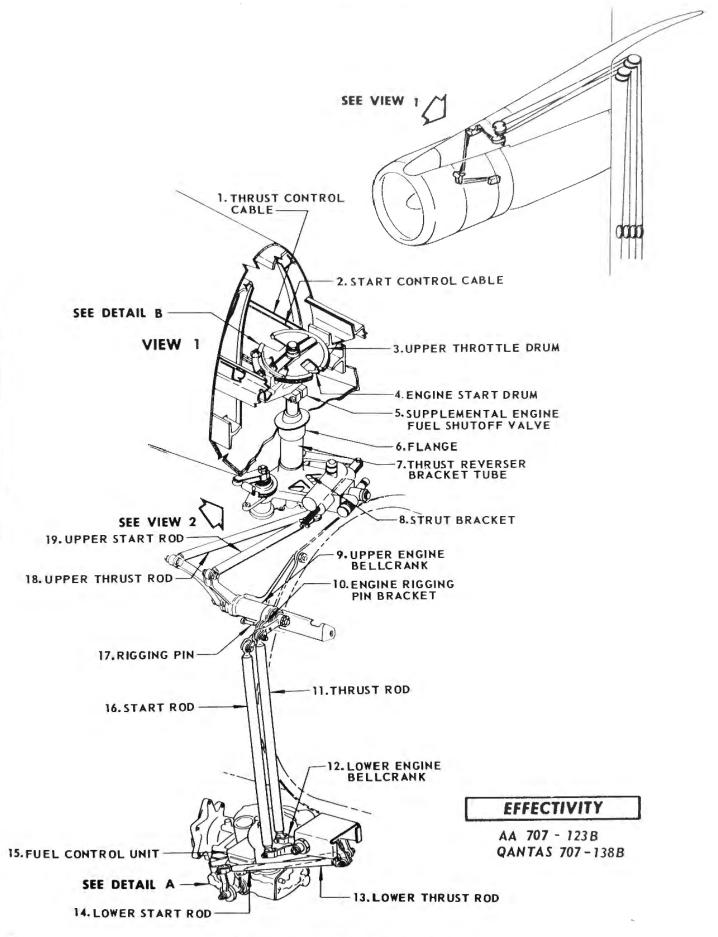
Fuel Control Unit Adjustment Figure 203

- (y) Install and tighten control cables between lower thrust drum cord drum (6) on power control shaft. Rig cable to 40 (± 5) pound tension.
- (z) Remove part power trim stop pin and place in stowed position.
- (aa) Remove clamps from thrust levers.
- (ab) Install cowl panel and access panels.
- (ac) Remove throttle rigging lock assembly from control stand.
- (ad) With thrust reverser control system rigged and clamshell doors open, advance all reverse thrust levers from idle until motion is stopped by respective thrust reverser lockout control.
 - NOTE: Steps (ad) through (af) are to be performed if reverse thrust levers do not align.
- (ae) Align all reverse thrust levers with lever closest to idle position.
- (af) Remove left and right access panels from control stand lower frame assembly. See "Access Doors and Panels," Chapter 12.
- (ag) Loosen cam follower detent assembly adjustment bolts on inside of left upper side panel and on left side of control stand bulkhead.
- (ah) Move detent assembly so that cam roller on each detent lever is in cam detent on respective thrust control drum.
- (ai) Keep reverse thrust levers aligned and tighten adjustment bolts.
- (a,j) Install access panels on control stand.
- (ak) Check adjustment of landing gear warning switch. See "Landing Gear Warning System," Chapter 32.
- (al) For engine No. 3, check adjustment of flap, speed brake, and stabilizer trim warning switch. See "Wing Flap Warning Circuit Components," Chapter 27.
- (2) Adjust Thrust System (AA 707-123B and QANTAS 707-138B airplanes)
 - (a) Remove engine left cowl panel.
 - (b) Insert rigging pin (23, figure 204) through bracket (8) and thrust reverser main valve actuating cam (22) on engine control drum and shaft assembly.



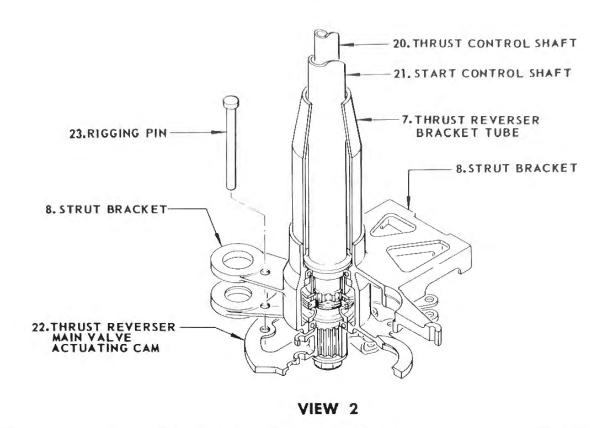
- (c) Position and lock thrust lever in idle no load position.
 - 1) Place 0.092 inch spacer against idle stop on control stand.
 - 2) Move forward thrust lever against spacer.
 - 3) Clamp thrust lever against spacer.
 - 4) Position reverse thrust lever to "OFF" position.
- (d) Lower wing leading edge flaps for turnbuckle access.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."
 - 3) Install leading edge flap down locks.
- (e) Adjust turnbuckles in wing leading edge to rig cables to load specified in figure 201. Use tensiometer to measure rigging load.
 - NOTE: If turnbuckle travel is not adequate for complete adjustment of cable tension, further adjustment is possible by use of turnbuckles in lower nose compartment and forward cargo compartment. Access in cargo compartment is provided by removal of ceiling. See Chapter 25, "Forward Cargo Compartment."
- (f) Remove leading edge flap down locks.
- (g) Raise wing flaps.
- (h) Depressurize utility hydraulic system.
- (i) Release adjustable control rod (18) from actuating cam (22)
- (j) Insert rigging pin (17) through rigging pin bracket (10) and throttle control arm on engine control drum and shaft assembly
- (k) Adjust upper thrust rod (18) so that rod may be attached with rigging pin installed and attach upper rod (18)
- (1) Release lower thrust rod (13) from thrust control arm (24).
- (m) Rotate thrust control arm (24) counterclockwise against full power stop. Hold until completion of step (n).
- (n) Use vernier spline (26) to adjust thrust control arm (24) until it is pointing aft and parallel to the horizontal center line of the engine within \pm 1/2 degree.

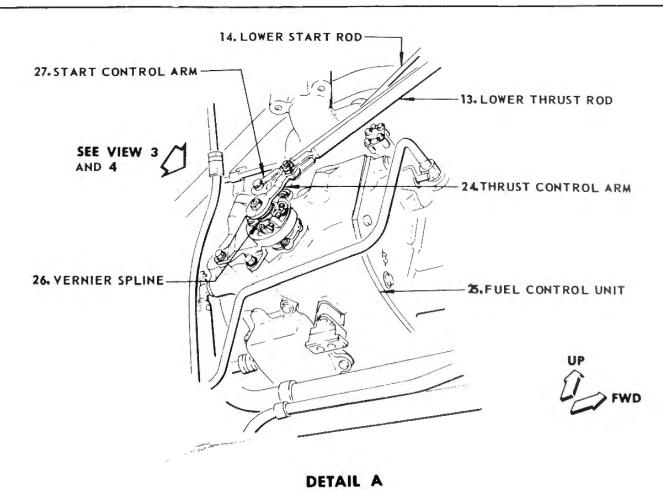




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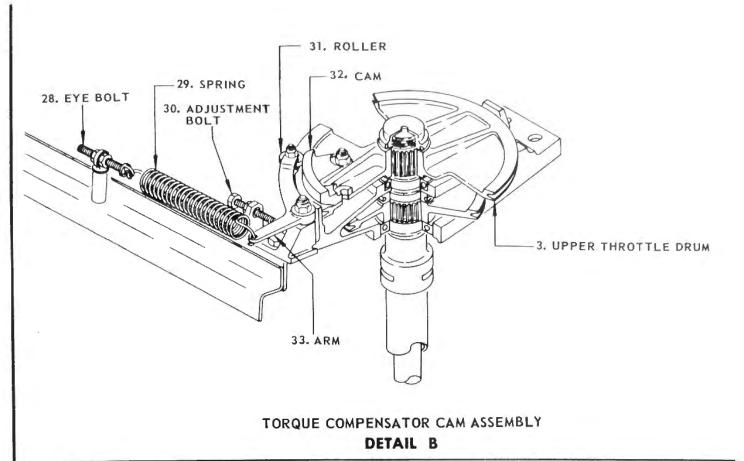


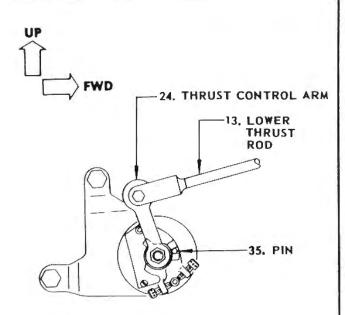


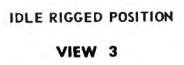


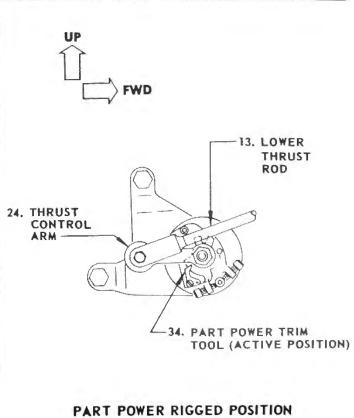
Engine Thrust Control System Adjustment Figure 204 (Sheet 2 of 3)











VIEW 4



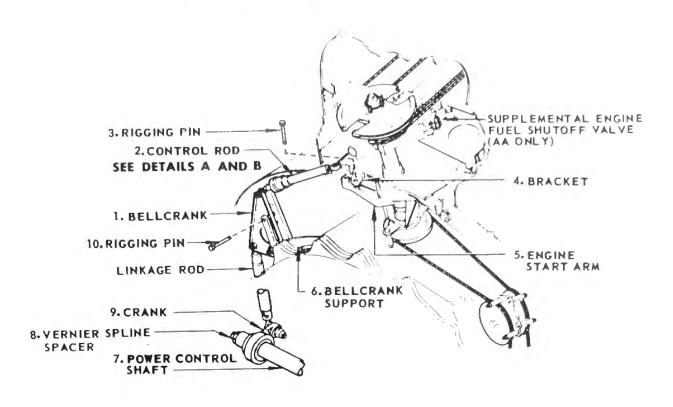
- (o) Rotate the thrust control arm (24) clockwise approximately 75 degrees and insert 0.093 (± 0.005) inch pin (35) thru stop in stop fitting into hole in fuel control unit marked "I."
- (p) Adjust length of lower thrust rod (13) so that it will attach freely to thrust control arm (24) and attach.
- (q) Remove all rigging pins and throttle clamps from system.
- (r) Install part power trim tool (34) to active position on fuel control unit.
- (s) Slowly advance each throttle until part power trim tool is contacted and gradually release lever.
- (t) Check that each throttle lever is aligned with all other levers within 0.25 inches measured at 12.00 inch radius from lever pivot. (Knob center lines are at 12.25 inch radius.)
- (u) If levers are not aligned correctly, re-adjust by adjusting length of upper thrust rod (18). Adjust to a mean lever position of 0.25 inches relative to other levers.

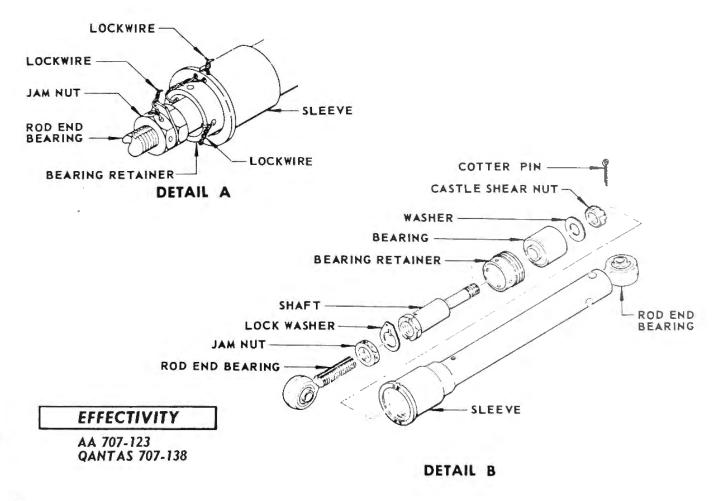
NOTE: If levers are adjusted per step (u), pins (17) and (23) may not fit.

- (v) Replace part power trim tool (34) to inactive position.
- (w) Adjust torque compensator cam assembly.
 - 1) With rigging pin (23) installed through strut bracket (8) and thrust reverser main valve actuating cam (22), adjust bolt (30) so that roller (31) contacts cam (32). Tighten lock nut on adjustment bolt (26) and lockwire.



- (3) Adjust Engine Start Control System (AA 707-103 and QAMMAD 707-138 airplanes)
 - (a) Position engine start lever in cutoff no load position.
 - 1) Place 0.41 inch spacer against "CUTOFF" detent stop on control stand
 - 2) Position engine start levers against spacer so that start lever detent lugs contact spacer. Clamp levers against spacer.
 - (b) Remove engine cowl panels.
 - (c) Insert rigging pin (3, figure 205) or AN5 bolt through engine start arm (5) and bracket (4).
 - (d) For outboard engine, lower wing leading edge flaps for turnbuckle access.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."
 - 3) Install leading edge flap down locks.
 - (e) For inboard engine, remove wing leading edge access panel No. 307 for turnbuckles access. See "Access Doors and Panels," Chapter 12.
 - (f) Adjust turnbuckles in wing leading edge to rig cables to load specified in figure 201. Use tensiometer to measure rigging load.
 - NOTE: If turnbuckles travel is insufficient for complete adjustment of cable tension, further adjustment is possible by use of turnbuckles in lower nose compartment and forward cargo compartment. Access in cargo compartment is provided by removal of ceiling. See Chapter 25, "Forward Cargo Compartment."
 - (g) Insert rigging pin (9, figure 205) or AN5 bolt through bellcrank (1) and support (6).
 - NOTE: If rigging holes in bellcrank and support cannot be aligned, perform steps (h) through (k).
 - (h) Disconnect control rod (2) from engine start arm.

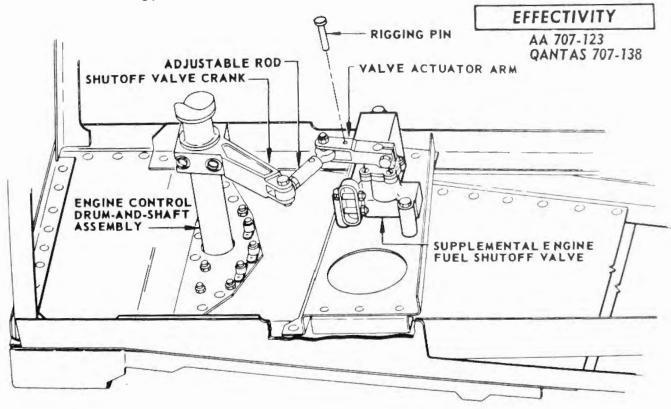






- (i) Insert rigging pin through bellcrank and support.
- (j) Adjust length of control rod to fit between strut start arm (1) and engine start lever (5).
 - 1) Break lockwire and loosen jam nut and lock washer.
 - 2) Lubricate rod end bearing with grease, specification MIL-6-3278.
 - 3) Rotate rod end bearing to adjust control rod length.
 - 4) Fit lock washer in slot in shaft and tighten jam nut.
 - 5) Lockwire nut to washer as shown in figure 203.
 - 6) Check that bearing retainer is installed and lockwired as shown in figure 203.
- (k) Install control rod between strut arm and engine start lever.
- (1) Remove crank (9) and vernier spline spacer (8) from right end of power control shaft (7).
- (m) On fuel control unit, move shutoff lever (4, figure 203) until index mark is at "25°" position. Hold in this position until completion of step (n).
- (n) Install crank (9, figure 205) on power control shaft (7) by rotating vernier spline spacer (8) until splines on crank will engage with splines on power control shaft.
 - NOTE: When nut is replaced on end of power control shaft tighten to 30-50 pound-inches torque.
- (o) On AA and TWA airplanes, adjust supplemental engine fuel shutoff valve.
 - 1) Remove nacelle strut access panel No. 739 (for outboard engine) or access panel No. 704 (for inboard engine).
 - 2) Insert rigging pin or AN3 bolt through shutoff valve actuator arm and shutoff valve. (See figure 206.)
 - 3) Adjust length of adjustable rod and install.
 - 4) Tighten check nut on crank end of adjustable rod.
- (p) Remove all rigging pins.

- (q) Install dowl panels and access panels.
- (r) Remove spacer from control stand.
- (s) Remove leading edge flap down locks.
- (t) Check adjustment of ignition switch. See Chapter 74, "Ignition Switches."
- (4) Adjust engine start control system. (AA 707-123B and QAMTAE 707-138B airplanes)
 - (a) Position engine start lever.
 - 1) Place 0.41 inch spacer against "CUTOFF" detent stop on control stand.
 - 2) Position engine start lever against spacer so that start lever detent lugs contact spacer. Clamp levers against spacer.
 - (b) Remove engine cowl panels.
 - (c) Lower wing leading edge flap for turnbuckle access.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."
 - 3) Install leading edge flap down locks.





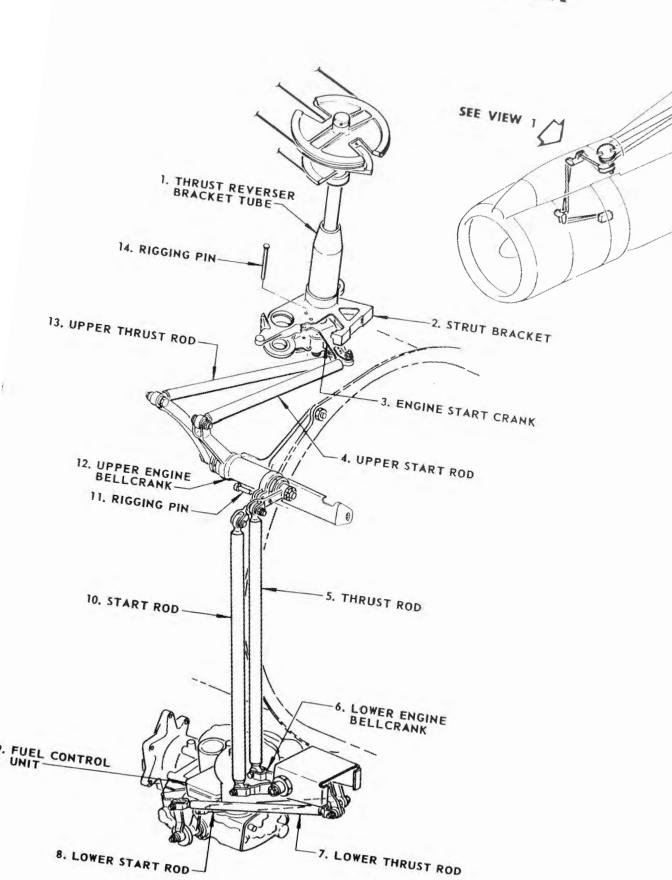
MAINTENANCE MANUAL

(d) Adjust turnbuckles in wing leading edge until a rigging pin (13) or AN5 bolt can be inserted freely through engine start crank (3) and strut bracket when cables are rigged to tension specified in figure 201. Measure cable load with tensiometer. (See figure 207.)

If turnbuckle travel is not adequate for complete NOTE: adjustment of cable tension, further adjustment is possible by use of turnbuckles in lower nose compartment and forward cargo compartment. Access in cargo compartment is provided by removal of ceiling. See Chapter 25, "Forward Cargo Compartment."

- (e) Adjust length of upper start rod (4) so that rigging pin (11) can be freely inserted through upper engine bell crank (12) and install rigging pin.
- (f) Release lower start rod (8) from start control arm.
- (g) Position start control arm at 37° index mark on fuel control unit. (80 degrees from horizontal.)
- Adjust length of lower start rod (8) so that rigging pin may (h) be freely inserted in crank.
- (i) Connect lower start rod (8) to start control arm.
- Adjust supplemental engine fuel shutoff valve. (i)
 - Remove nacelle strut access panel No. 3716 (for engines equipped with turbocompressor.
 - Remove nacelle strut access panel No. 1739 (for engines not equipped with turbocompressor.
 - Insert rigging pin through shutoff valve actuator arm and shutoff valve. (See figure 208.)
 - Adjust length of adjustable rod and install.
 - 5) Tighten check nut on crank end of adjustable rod.
- (k) Remove rigging pins.
- (1) Install cowl panels and access panels.
- (m) Remove clamps from engine start lever.
- (n) Remove spacer from behind lever.
- (o) Remove leading edge flap down locks.

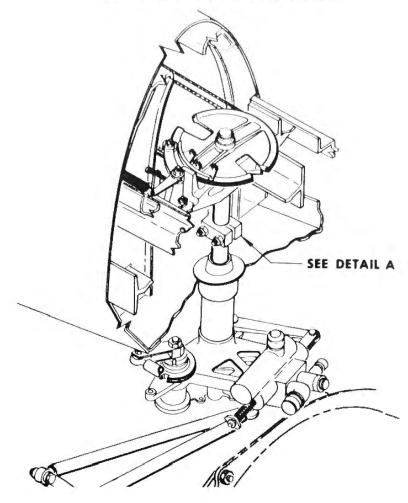


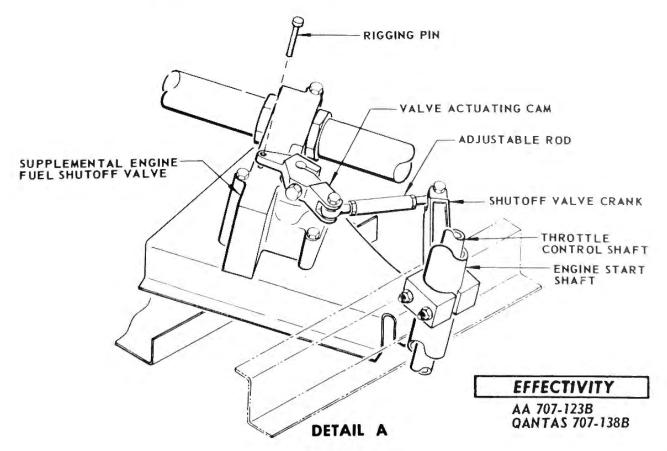


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Engine Start System Adjustment Figure 207







- (p) Check adjustment of ignition switch. See Chapter 74, "Ignition Switches."
- D. Test Throttle System (AA 707-123 and QANTAS 707-138 Airplanes)
 - (1) Remove engine left cowl panel.
 - (2) Attach air pressure source to Pth shuttle valve ground service connection. Adjust gage pressure to 50 psi.
 - (3) Set friction regulator brake handle at aft position.
 - (4) Using spring scale at knob center line, advance forward thrust lever through entire travel. Load on lever shall not exceed 3.5 pounds.
 - (5) Return thrust lever to idle position.
 - (6) Set brake handle at fully forward position.
 - (7) Advance thrust lever through entire travel. Load on lever shall be 2 to 4 pounds more than load observed in step (4). Ratchet on brake handle shall retain friction regulator setting during lever travel.
 - (8) Return thrust lever to idle position.
 - (9) Return friction regulator brake handle to aft position.
 - (10) Pull reverse thrust lever from "OFF" position aft through full travel. Force required to pull lever from "OFF" detent should be 1.5 (+3.0/-0.0) pounds and should not exceed 4.5 pounds at any point in travel.
 - (11) Return lever to idle position.
 - (12) Advance engine start lever to "IDLE" position. Load on lever at beginning of travel shall not exceed 3 pounds. Load shall not exceed 10.0 pounds at any point of travel.
 - (13) Return lever to "CUTOFF" position
 - (14) Check that supplemental engine fuel shutoff valve is in closed position.
 - (15) Mount throttle warning horn protractor assembly on control stand.
 - (16) Clamp reverse thrust lever protractor assembly to reverse thrust lever.



- (17) Position forward thrust lever so that power control lever on fuel control unit is at "IDLE" index. (See figure 203.) Thrust lever shall be against idle stop within 2 degrees. Measure angle with throttle warning horn protractor assembly.
- (18) Advance forward thrust lever 61-1/2 (± 2) degrees from idle stop. Power control lever shall be 70 to 74 degrees from "IDLE" index in forward direction. Use bubble inclinometer to measure angle.
- (19) With forward thrust lever not less than 5° from "IDLE" pull reverse thrust lever aft until motion is locked by pawl. Lever shall not be more than 15 degrees from idle position. Measure angle with reverse thrust lever protractor assembly.
- (20) Using spring scale, apply 20 pound load in aft direction to reverse thrust lever. Pawl shall resist load.
- (21) Return forward thrust lever to idle position.
- (22) Pull reverse thrust lever aft until cam follower detent is felt. Lever should be 55 to 70 degrees from idle position.
- (23) Apply 20 pound load in forward direction to forward thrust lever. Pawl shall resist load.
- (24) Pull reverse thrust lever aft 126 (± 4) degrees from idle position. Power control lever shall be 53 to 57 degrees from "IDLE" index in aft direction.
- (25) Return reverse thrust lever to idle position.
- (26) With engine start lever in "CUTOFF" position, shutoff lever on fuel control unit shall be at "25°" index.
- (27) Advance start lever to "START" position. Shutoff lever shall be at least 36 degrees from "25°" index.
- (28) Advance start lever to "IDLE" position. Shutoff lever shall be at least 53 degrees from "25°" index.
- (29) Return lever to "CUTOFF" position.
- (30) Remove protractor assemblies.
- (31) Disconnect air pressure source.
- (32) Install cowl panel.

E. Test Throttle System

- (1) Test engine start system. (AA 707-123B and QANTAS 707-138B airplanes)
 - (a) Remove engine cowl panels.
 - (b) Apply 25 psig pressure at the P_{t4} ground service connection.

 CAUTION: CHECK THAT BOTH ENGINE AND FAN COWL PANELS ARE COMPLETELY REMOVED BEFORE CONNECTING AIR SUPPLY.
 - (c) Insert rigging pin through start crank and strut bracket.
 - (d) Check that start lever has 4-1/4° (± 2°) overtravel to "CUTOFF."
 - (e) Check that indicator on fuel control unit is at 37° (±1°) scribe mark.
 - (f) On airplanes equipped with supplemental fuel shutoff valve, check that rigging pin fits freely in shutoff valve lever in rigged off position.
 - (g) Remove rigging pins.
 - (h) Advance start lever to "START" position.
 - (i) Check that lever load as measure at knob center line does not exceed 2.5 pounds at start of motion. (5.5 pounds for airplanes equipped with supplemental fuel shutoff valve.)
 - (j) Check that start lever on fuel control unit has traveled at least 44° from position at "CUTOFF."
 - (k) On airplanes equipped with supplemental fuel shutoff valve, check that shutoff valve lever has traveled at least 85° from position at "CUTOFF."
 - (1) Advance start lever to "IDLE" position.
 - (m) Check that load on lever through full range of travel does not exceed 7.5 pounds (10.0 pounds on airplanes equipped with supplemental fuel shutoff valve.)
 - (n) Check that start lever on fuel control unit has traveled at least 53° from "CUTOFF" position.
 - (o) On airplanes equipped with supplemental shutoff valve check that shutoff valve lever has traveled at least 90° from "CUTOFF" position.



(2) Test Thrust System

- (a) Set friction regulator brake handle at full aft position.
- (b) Using spring scale at knob center line, advance forward thrust lever through entire travel.
- (c) Check that load on lever does not exceed 3.5 pounds.
- (d) Return thrust lever to idle position.
- (e) Set brake handle at fully forward position (full brake).
- (f) Advance thrust lever through entire range of travel.
- (g) Check that load on lever is 2 to 4 pounds greater than load observed in step (c).
- (h) Check that friction regulator brake handle retains setting during lever travel.
- (i) Return thrust lever to idle position.
- (j) Return friction regulator brake handle to full aft position.
- (k) Remove part power trim tool from stowed position and install in active position.
- (1) Advance forward thrust lever until lever on fuel control unit contacts stop.
- (m) Check that forward thrust lever has traveled 38° (± 3°) from idle position.
- (n) Slowly release each lever and allow to spring back. Check that each lever is aligned within 1/4 inch of adjacent levers.
- (o) Return thrust lever to idle position.
- (p) Return part power trim tool to stowed position.
- (q) Advance forward thrust lever until full forward thrust stop is contacted.
- (r) Check that lever has traveled at least 66-1/2° from idle position.
- (s) Gradually release lever allowing it to spring back.
- (t) Check that final lever position is at least $59-1/2^{\circ}$ from idle position.



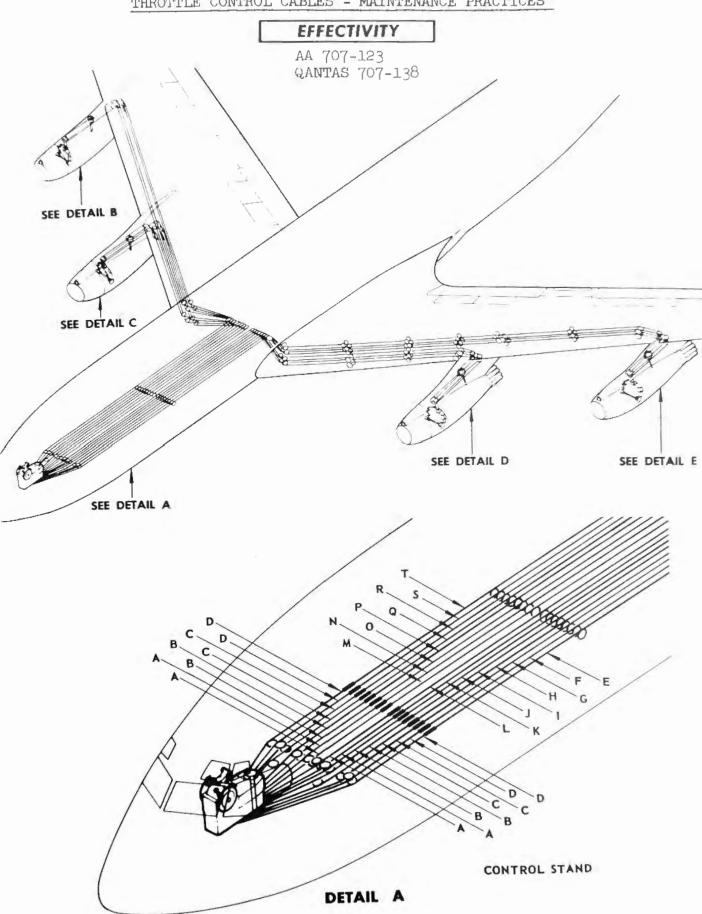
- (u) Check that thrust control lever on fuel control unit is at least 71.2° counterclockwise from idle position.
- (v) Check that thrust reverser main valve actuating cam is within 0.03 inches of or against 100% forward thrust stop.
- (w) Move forward thrust lever to idle position.
- (x) Position reverse thrust lever not less than 20° from off position.
- (y) Apply 20 pound load in forward direction to forward thrust lever.
- (z) Check that locking device resists load.
- (aa) Return forward thrust lever to idle position.
- (ab) Move reverse thrust lever to full aft position.
- (ac) Turn air supply off.
- (ad) Move reverse thrust lever to "OFF" position.
- (ae) Advance forward thrust lever against stop position and apply 50 pound load to lever in forward direction. Follow up lock shall withstand load.
- (3) Test Reverse Thrust System
 - (a) Restore 25 psig. pressure to Pth port.
 - (b) Position forward thrust lever 5° (± 2°) from idle position.
 - (c) Pull reverse thrust lever aft until motion is locked by pawl.
 - (d) Check that lever is not more than 15° from idle position.

 Measure angle with reverse thrust lever protractor assembly.
 - (e) Using spring scale apply 10 pound load in aft direction. To each reverse thrust lever, a pawl shall resist load.
 - (f) Return forward thrust lever to idle position.
 - (g) Move reverse thrust lever to "OFF" position then using spring scale move lever aft through full range of travel.
 - (h) Check that load required to pull lever from "OFF" detent is 1.5 (+1.5/-1.0) pounds.

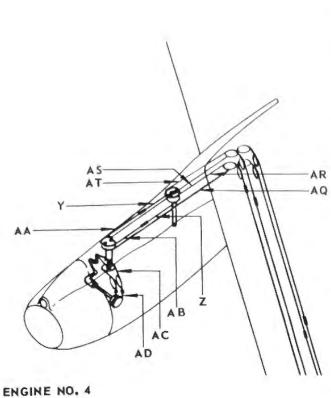


- (i) Check that load does not exceed 6.0 pounds at any point during first 65° of travel nor 5.0 pounds during remainder of travel.
- (j) Check that lever is $139-1/2^{\circ}$ (± 4°) from "OFF" position.
- (k) Gradually release lever and allow it to spring back.
- (1) Check that final lever position is 122° (± 4°) from "OFF position.
- (m) Check that thrust control lever on fuel control unit is at least 52° clockwise from idle position.
- (n) Check that thrust reverser main valve actuating cam is within 0.03 inches of or against 100% reverse thrust stop.
- (o) Return reverse thrust levers to "OFF" position.
- (p) Disconnect air supply.
- (q) Position reverse thrust lever in aft stop position.
- (r) Apply a 50 pound load to lever in aft direction.
- (s) Follow up lock should withstand load.
- (4) Test Friction Brake Regulator
 - (a) Rotate friction brake regulator lever through full travel.
 - (b) Check that lever moves freely through full travel.
 - (c) Check that force required to disengage lever handle from ratchet is 5 to 10 pounds.
 - (d) Check that friction brake regulator lever retains setting during full travel of forward thrust levers.
 - (e) Replace cowl panels.

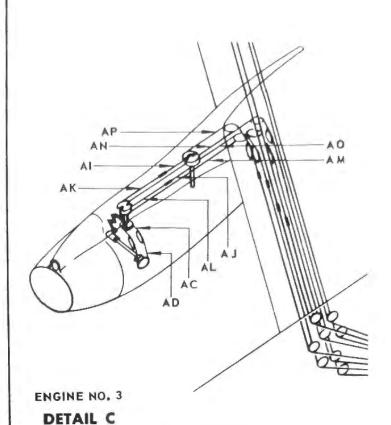
THROTTLE CONTROL CABLES - MAINTENANCE PRACTICES

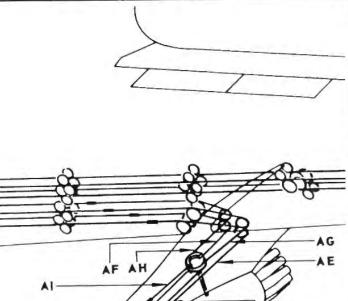


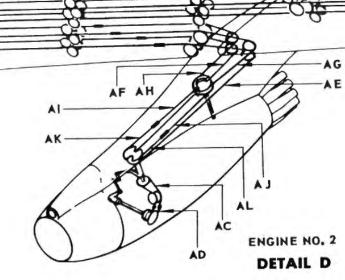


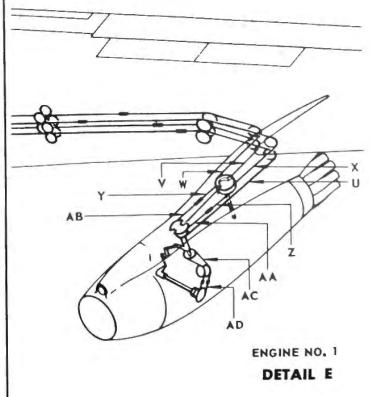


DETAIL B









Throttle Control Cables Figure 201 (Sheet 2 of 5)



BOEING 707 MAINTENANCE MANUAL

QANTAS REVISION NO. 2

General

This revision sheet provides Company instructions and procedures supplementary to or superseding those contained in the above publication.

Action

Insert this revision adjacent to Chapter 76-1-21, Figure 201, Sheet 3, Page 203 and enter the details on the revision list at the front of the Maintenance Manual.

Authority

Status Minute No. 19744.

THROTTLE CONTROL CABLES - MODIFICATION

The No. 2 and No. 3 engine start cables have been modified to replace the single run cable with a two piece cable to facilitate cable replacement. The new cables are listed below.

0-1		Cable	
System	Engine End	Turnbuckle	Flight Station End
No. 2 Start K No. 2 Start L No. 3 Start M No. 3 Start N	NAS303-45-2694 NAS303-45-2560 NAS303-45-2560 NAS303-45-2694	AN155-16L AN155-16L AN155-16L AN155-16L	NAS303-46-2360 NAS303-46-2512 NAS303-56-2512 NAS303-56-2360

Jan.	CABLE	DRAWING	NO.		LENGTH		CABLE		FITT	INGS	
	REF.	NO.	REQ.	A	В	С	SIZE	1.	2.	3.	4.
15/59	A	66-3155-20	2	501.2	260,5	96.0	3/32 × 7 × 7	AN669S3LH			
55	В	66-3155-18	2	497.5	257.6	82.6	3/32 x 7 x 7	AN66953LH	BAC-T14B-3	BAC-T14B-3	AN669S3LH
9	С	66-3155-19	2	341.3	180.6	13.2	3/32 × 7 × 7	AN66953LH	BAC-T14B-3	BAC-T14B-3	AN66953LH
	D	66-3155-17	2	401.9	200.8	23.9	3/32 × 7 × 7	AN66953RH	BAC-T14B-3	BAC-T14B-3	AN66953LH
	E	NAS-303-47-7770	1	777.0	-0.77		3/32 × 7 × 7	AN66953LH	BAC-T14B-3 AN669L3RH	BAC-T14B-3	AN669SCLH
	F	NAS-303-46-7574	1 1	754.5			3/32 × 7 × 7	AN66953RH	AN669L3RH		
	G	NAS-303-46-8495	1	849.6			3/32 × 7 × 7	AN66953RH	AN669L3RH	1 1	
	Н	NAS-303-46-8551	1	855.1			3/32 × 7 × 7	AN669S3RH	AN669L3RH	1	
	1	NAS-303-46-4776	1	477.8			$3/32 \times 7 \times 7$	AN66953RH	AN669L3RH	1	
	K	NAS-303-46-4802	1	480.3			3/32 x 7 x 7	AN66953RH	AN669L3RH		
		NAS-303-46-5084	1	508.5	1 4		$3/32 \times 7 \times 7$	AN669S3RH	AN669L3RH		
	L	NAS-303-46-5102	1	510,3			3/32 × 7 × 7	AN66953RH	AN669L3RH		
	M	NAS-303-56-5102	1	510,3			3/32 x 7 x 7	AN669S3RH	AN669L3LH		
译日	N	NAS-303-56-5084	1	508.5	1		3/32 x 7 x 7	AN66953RH	AN669L3LH		
25 12	0 P	NAS-303-56-4802	I	408.3			3/32 x 7 x 7	AN66953RH	AN669L3LH		
Throttle Figure 20		NAS-303-56-4776	1	477.8	1		3/32 × 7 × 7	AN669S3RH	AN669L3LH))	
CT I		NAS-303-56-8551	1 1	855, 1			$3/32 \times 7 \times 7$	AN669S3RH	AN669L3LH		
1e 201		NAS-303-56-6495	1 1	649.6	1		$3/32 \times 7 \times 7$	AN669S3RH	AN669L3LH		
		NAS-303-56-7544	1 1	754.5	1		3/32 × 7 × 7	AN66953RH	AN669L3LH		
Control L (Sheet	Ü	NAS-303-57-7770	1	777.0	1 1		3/32 x 7·x 7	AN66953LH	AN669L3LH		
55 de	-	BAC-C13G-319-1390	1 1	139.0	1 1		3/32 x 7 x 7	AN669L3LH	BAC-T14A-3		
99		BAC-C13G-319-1510	1 1	151.0			$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
4 5		BAC-C13G-319-1740 BAC-C13G-319-1450	1 1	174.0	1		$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
ယဂ္ဂ		BAC-C13G-320-252	1 1	145.0	1 1		3/32 x 7 x 7	AN669L3LH	BAC-T14A-3		
0 8		BAC-C13G-320-352	1	25.2	1 1		$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
Cables 3 of 4)		BAC-C13G-319-376	2	35, 2	1 1		$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
2 4		BAC-C13G-319-270	2	37.6	1		$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
		BAC-C13G-J300-668	2	27.0			$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
		BAC-C13G-G158-386	4	66.8	30.0		$3/32 \times 7 \times 7$	AN669S3RH	BAC-T148-3	AN669S3RH	
	Aug. To a	BAC-C13G-319-1460	4	38.6	15,8		$3/32 \times 7 \times 7$	AN669S3LH	BAC-T14B-3	AN669S3LH	
3		BAC-C13G-319-1340	1 1	146.0			$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
	AG	BAC-C13G-319-1265		134.0	1 1		$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
- 1		31,501,203	' I	126.5			$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
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ENGINE CONTROLS
Throttle Control Cables
Maintenance Practices

MAINTENANCE MANUAL

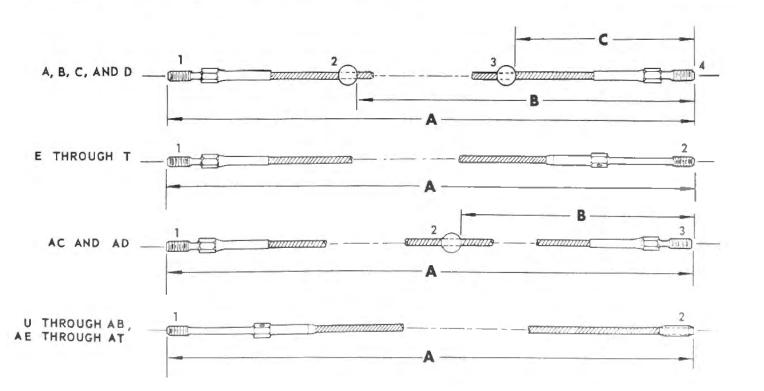
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ENGINE CONTROLS

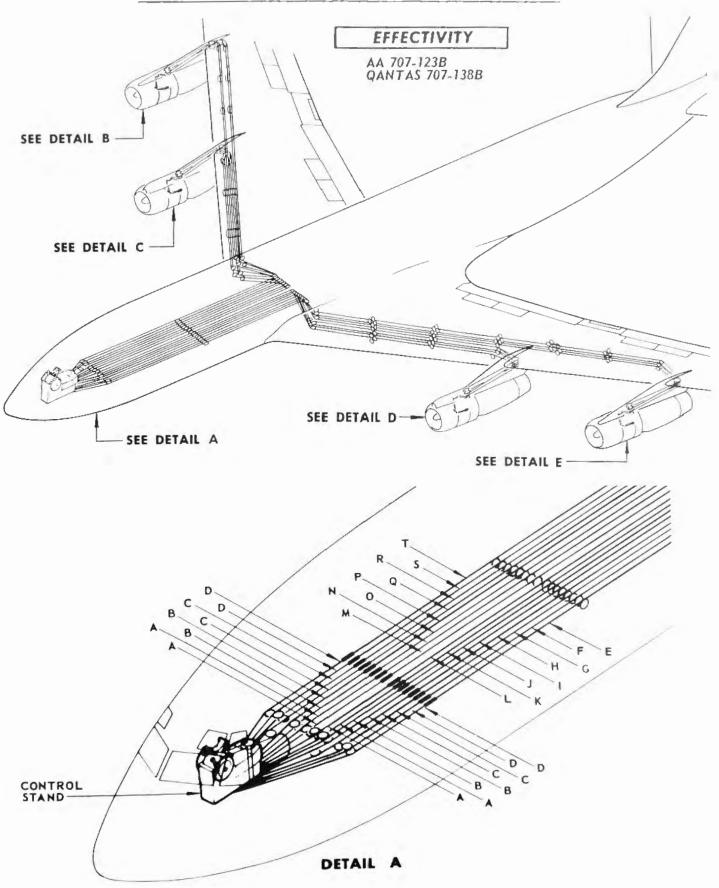
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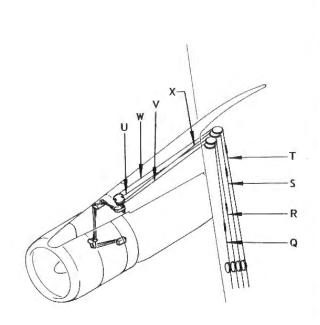
CABLE	DRAWING	NO.		LENGTH		CABLE		FITTIN	IGS	
REF.	NO.	REQ.	A	В	С	SIZE	1,	2.	3.	4,
АН	BAC-C13G-319-1385	1	138.5			3/32 × 7 × 7	AN669L3LH	BAC-T14A-3		
AI	BAC-C13G-310-1265	1	126.5			$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
AJ	BAC-C13G-320-365	2	36.5			$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
AK	BAC-C13G-319-270	2	27.0			3/32 x 7 x 7	AN669L3LH	BAC-T14A-3		
AL	BAC-C13G-319-270	2	26.0			$3/32 \times 7 \times 7$	AN669L3LH	BAC-T14A-3		
AM	BAC-C13G-320-1235	1	123.5			$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
AN	BAC-C13G-320-1558	1	155.8			$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
AO	BAC-C13G-320-1160	1	116.0	1		3/32 × 7 × 7	AN669L3RH	BAC-T14A-3		
AP	BAC-C13G-320-1484	1	148.4			3/32 × 7 × 7	AN669L3RH	BAC-T14A-3		
AQ	BAC-C13G-320-1288	1	128.8			$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
AR	BAC-C13G-320-1600	1	160.0			$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
AS	BAC-C13G-320-1543	1	164.3			$3/32 \times 7 \times 7$	AN669L3RH	BAC-T14A-3		
AT	BAC-C13G-320-1543	1	154.3			3/32 x 7 x 7	AN669L3LH	BAC-T14A-3		



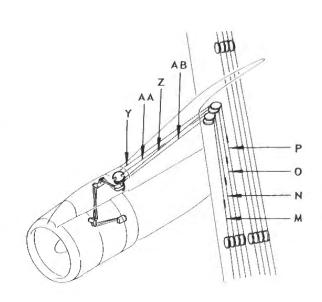
THROTTLE CONTROL CABLES - MAINTENANCE PRACTICES



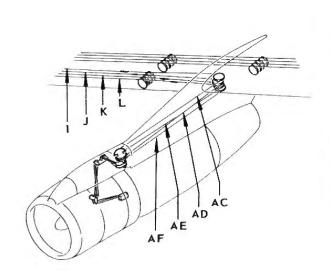




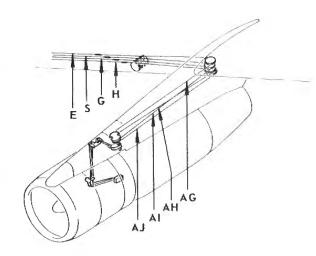
DETAIL B



DETAIL C



DETAIL D



DETAIL E

Throttle Control Cables Figure 201 (Sheet 2 of 5)



BOEING 707 MAINTENANCE MANUAL

QANTAS REVISION NO. 1

General

This revision sheet provides Company instructions and procedures supplementary to or superseding those contained in the above publication.

Action

Insert this revision adjacent to Chapter 76-1-22, Page 203 and enter the details on the revision list at the front of the Maintenance Manual.

Authority

Status Minute No. 19744.

THROTTLE CONTROL CABLES - MODIFICATION.

The No. 2 and No. 3 engine thrust cables have been modified to replace the single run cable with a two piece cable to facilitate cable replacement. The new cables are listed below.

System & Cable		Cable	
Reference	Engine End	Turmbuckle	Control Cabin End.
No. 2 Thrust J No. 3 Thrust O	NAS303-45-1781 NAS303-44-1970 NAS303-45-1970 NAS303-45-1781	AN155-16L	NAS303-46-2685 NAS303-56-2476 NAS303-56-2476 NAS303-56-2685

CABLE	DRAWING	NO.		LENGTH		CABLE		FIT	TINGS	
REF.	NO.	REQ.	A	В	С	SIZE	1.	2.	3.	4.
A	66-3155-20	4	501.2	260.5	96.0	3/32 7 × 7	AN669S3 LH	BAC-T14B-3	BAC-T14B-3	AN669S3LH
В	66-3155-18	4	497.5	257.6	82.6	3/32 7 × 7	AN669S3LH	BAC-T14B-3	BAC-T14B-3	AN669S3LH
С	66-3155-19	4	341.5	180.6	13.2	3/32 7 x 7	AN669S3LH	BAC-T14B-3	BAC-T14B-3	AN66953LH
D	66-3155-17	4	401.9	200.8	23.9	3/32 7 x 7	AN66953LH	BAC-T14B-3	BAC-T14B-3	AN66953LH
E	NAS-303-46-8365	1	836.63			3/32 7 x 7	AN669L3RH	AN669L3LH		
F	NAS-303-46-8143	1	814.38			3/327 x 7	AN669L3RH	AN669L3RH	-	
G	NAS-303-46-9092	1	909.25			3/32 7 x 7	AN669L3RH	AN669L3RH		
н	NAS-303-46-9150	1	915.00			3/32 7 × 7	AN669L3RH	AN669L3RH		
1	NAS-303-46-4496	1	449.6			3/32 7 × 7	AN669L3RH	AN669L3RH		
J	NAS-303-46-4476	1	447.6			3/32 7 × 7	AN669L3RH	AN669L3RH		
K	NAS-303-46-5702	1	570.25		1	3/32 7 x 7	AN669L3RH	AN669L3RH		
L	NAS-303-46-5690	1	569.00			3/32 7 × 7	AN669L3RH	AN669L3RH		
м	NAS-303-56-5690	1	569.00			3/327 x 7	AN669L3LH	AN669L3RH		
N	NAS-303-56-5702	1	570.25			3/327 x 7	AN669L3LH	AN669L3RH		
0	NAS-303-56-4476	1	447.6			3/32 7 x 7	AN669L3LH	AN669L3RH		
P	NAS-303-56-4496	1	449.6			3/32 7 x 7	AN669L3LH	AN669L3RH		
Q	NAS-303-56-9150	1	915.00			3/32 7 × 7	AN669L3LH	AN669L3RH		
R	NAS-303-56-9092	1	909.25			3/32 7 x 7	AN669L3LH	AN669L3RH		
S	NAS-303-56-8143	1	814,38			3/32 7 × 7	AN669L3LH	AN669L3RH		
Т	NAS-303-57-8365	1	836.63			3/32 7 x 7	AN669L3LH	AN669L3LH		
U	BAC-C13G-320-1605	1	160.5			3/32 7 x 7	AN669L3RH	BAC-T14A-3		
٧	BAC-C13G-320-1288	1	128.8			3/32 7 x 7	AN669L3RH	BAC-T14A-3		
W	BAC-C13G-320-2215	1	221.5			3/32 7 × 7	AN669L3RH	BAC-T14A-3		
X	BAC-C13G-320-2215	1	221.5			3/32 7 x 7	AN669L3RH	BAC-T14A-3		
Υ	BAC-C13G-320-2360	T	236.0			3/32 7 x 7	AN669L3RH	BAC-T14A-3		
Z	BAC-C13G-320-2036	1	203.6			3/32 7 x 7	AN669L3RH	BAC-T14A-3		

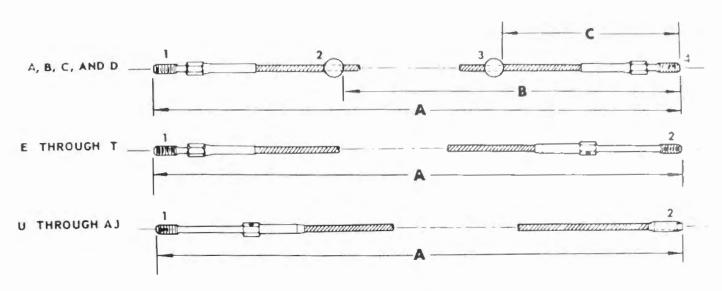
MAINTENANCE MANUAL

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CABLE	DRAWING	NO.		LENGTH		CABLE		FITTI	NGS	
REF.	NO.	REQ.	A	В	С	SIZE	1.	2.	3.	4.
AA	BAC-C13G-320-1558	1	155.8			3/32 7 × 7	AN669L3RH	BAC-T14A-3		
AB	BAC-C13G-320-1235	1	123.5			3/32 7 × 7	AN669L3RH	BAC-T14A-3		
AC	BAC-C13G-319-2261	1	226.1			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
AD	BAC-C13G-319-2040	1	204.0			3/32 7 × 7	AN669L3LH	BAC-T14A-3		U.
AE	BAC-C13G-319-1460	1	146.0			3/327×7	AN669L3LH	BAC-T14A-3		
AF	BAC-C13G-319-1343	1	134.3			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
AG	BAC-C13G-319-2028	1	202.8			3/32 7 × 7	AN669L3LH	BAC-T14A-3		
АН	BAC-C13G-319-1510	1	151.0			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
Al	BAC-C13G-319-2312	1	231.2			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
AJ	BAC-C13G-319-1390	1	139.0			3/32 7 x 7	AN669L3LH	BAC-T14A-3		

MAINTENANCE MANUAL

ENGINE CONTROLS
Throttle Control Cables
Maintenance Practices



Throttle Control Cables
Figure 201 (Sheet 5 of 5)

END

THRUST LEVER FRICTION BRAKE - MAINTENANCE PRACTICES

- 1. Removal/Installation Thrust Lever Friction Brake Crank
 - A. Equipment and Materials
 - (1) Tensionmeter 0 to 100 pounds capacity
 - (2) Dowel 1-1/2 inches diameter, 10 inches long
 - (3) Rigging pins MS20392-4 or equivalent
 - B. Remove Thrust Lever Friction Brake Crank
 - (1) Depressurize hydraulic systems.
 - (a) Connect electrical power.
 - (b) Manually position the utility system bypass valve to "BYPASS."
 - (c) Connect the utility and auxiliary hydraulic systems by operating the interconnect switch on the copilot's instrument panel.
 - (2) On AA 707-123 and CANTAS 707-138 airplanes remove nacelle strut access panels No. 742 (for outboard engines) and access panels No. 708 (for inboard engines). See Chapter 12, "Access Doors and Panels."
 - (3) On AA 707-123B and QANTAS 707-138B airplanes remove nacelle strut access panels No. 3716 (for turbocompressor equipped engines) and access-panels No. 1739 (for other engines). See Chapter 12, "Access Doors and Panels."
 - (4) Open main gear wheel well doors and right engine cowl panel.
 - (5) Insert rigging pin or AN5 bolt through each thrust reverser control drum and hanger. (See figure 210.)
 - (6) On AA 707-123B and QANTAS 707-138B airplanes insert rigging pin or AN5 bolt through strut bracket and thrust reverser main valve actuating cam on engine control drum and shaft assembly.
 - (7) Insert rigging pin or AN5 bolt in center speed brake control drum and drum support in right wheel well. (See figure 209.)

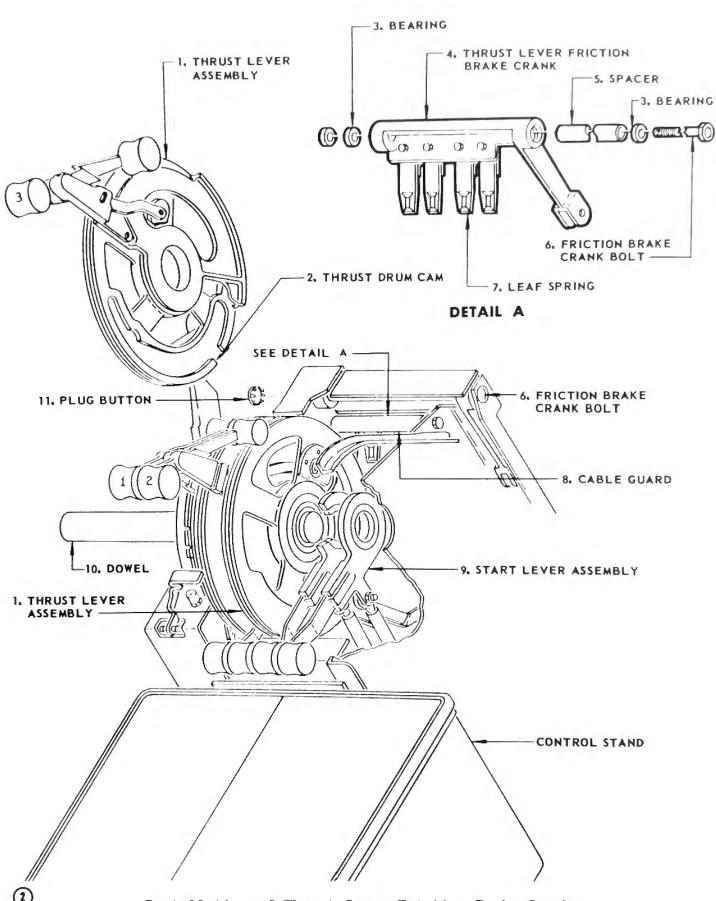


- (8) Install rigging pin or AN5 bolt through flap control valve support bracket and follow-up cable drum in each main gear wheel well. (See figure 211.)
- (9) Insert rigging pin or AN5 bolt through engine start arm and bracket. (See figure 210.)
- (10) Relieve tension on stabilizer trim chain assembly by adjusting support linkages to raise forward mechanism. (See figure 205.)
- (11) Relieve tension on wing flap control cables by loosening turnbuckles in lower nose compartment.
- (12) Relieve tension on speed brake control cables by loosening turnbuckles in lower nose compartment.
- (13) Relieve tension on thrust cables for engines No. 1 and No. 2. Disconnect thrust cables for engines No. 3 and No. 4.
- (14) Relieve tension on all engine start cables.
- (15) Remove left tie rod nut (15, figure 204.)
- (16) Pull stabilizer trim control wheel tie rod (6) from stabilizer trim control wheel shaft (1).
- (17) Remove right stabilizer trim control wheel (5) from stabilizer trim control wheel shaft.
- (18) Remove upper right access cover (4).
- (19) Remove forward right electronic unit (13) from aft electronic panel.
- (20) Remove lower right access panel (7) to gain access to the mounting nuts on upper right side panel (9).
- (21) Remove switch guard (8) to gain access to bolt (14) for removal of upper right side panel.
- (22) Loosen stabilizer trim indicator crank bolt from nutplate (11) on upper right side panel.
 - NOTE: Do not remove bolt from stabilizer trim indicator crank.
- (23) Remove bolt (14) from within aft electronic panel and upper right side panel. Nut will be free to fall when bolt (14) is removed.

- (24) Remove right control shaft nut (3).
- (25) Remove bottom screws in upper right side panel (9) and remove splice channel (10). Two nuts will be free to fall when bottom screws are removed.
- (26) Remove key (2) from slot in upper right side panel (9) and right control shaft (12), as upper right side panel is moved to right.
- (27) Remove upper right side panel (9).
- (28) Replace right control shaft nut (7, figure 203) on right control shaft (1) to allow removal of spacer, stabilizer trim indicator, friction brake handle and flap handle as a unit.
- (29) Detach eye bolt (4) from friction brake crank (2) by removing bolt (3).
- (30) Detach stabilizer trim indicator link (10) from stabilizer trim indicator crank (8) by removing flat head pin (9).
- (31) Remove right control shaft (1) with nut, spacer, trim indicator, friction brake handle and flap handle as a unit.
- (32) Rotate left stabilizer trim wheel until the connector link (6) in the stabilizer trim chain is in an accessible position for removal.
- (33) Detach connector link and remove chain from sprocket. Secure chain in bottom of control stand.
- (34) Remove start lever detents (11, figure 202) from cover assemblies (2).
- (35) Remove forward and aft cover tie straps (1 and 13).
- (36) Remove forward and aft cover angles (3 and 8).
- (37) Disconnect mach trim warning light cover (11, figure 203).
- (38) Lift cover assemblies (2, figure 202) from control stand.
- (39) Remove switch actuator arm (4).
- (40) Remove left stabilizer trim control wheel (12) from stabilizer trim control wheel shaft (5).
- (41) Remove stabilizer trim control wheel shaft (5) and sprocket (6) from right side of control stand.



- (42) Remove left control shaft nut (10) from left control shaft.
- (43) Using dowel (10, figure 201), push left control shaft clear of control stand.
 - NOTE: Key (9, figure 202) will be free from left control shaft and upper left side panel when left control shaft is driven from control stand.
- (44) Pull dowel to left until No. 3 and 4 thrust lever assemblies can be lifted out of quadrant.
 - NOTE: Tag position of all spacers as they are removed. Position and thickness of spacers may vary in different control stands.
- (45) Pull start levers aft to obtain room for removal of friction brake crank from control stand.
- (46) Remove cable guard (8, figure 201) by removing bolt.
- (47) Remove plug button (11) from upper left side panel.
- (48) Remove bolt (6) and lift friction brake crank (4) from control stand.
 - NOTE: Bearings (3) and spacer (5) will be free in brake crank when bolt (6) is removed.
- C. Install Thrust Lever Friction Brake Crank
 - (1) Install spacer (5, figure 201) and bearings (3) in friction brake crank (4).
 - (2) Place friction brake crank (4) in control stand and secure by installing brake crank bolt (6).
 - (3) Install plug button (11) in upper left side panel.
 - (4) Install cable guard (8) in control stand.
 - (5) Install Nos. 3 and 4 thrust lever and Nos. 3 and 4 start lever in control stand.
 - (a) Position levers from right to left in following order: No. 4 start, No. 4 thrust, No. 3 start and No. 3 thrust.
 - (b) Position spacers in the order they were removed.



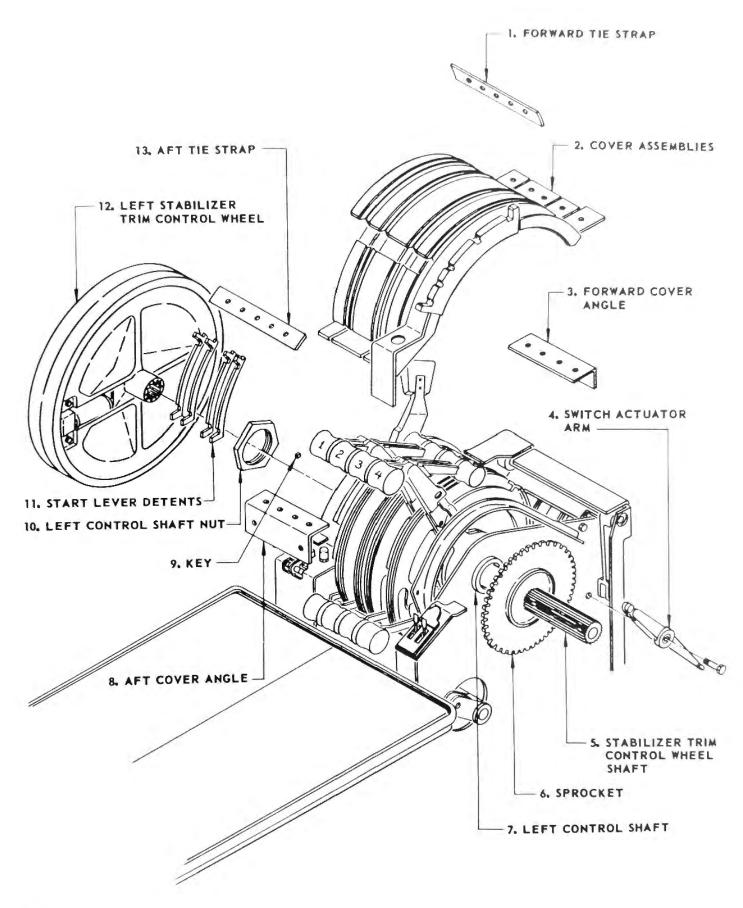


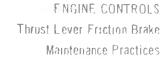
- (c) Advance left control shaft from right to left as levers and spacers are positioned.
- (6) Complete installation of left control shaft.
 - (a) Push left control shaft against dowel (10).
 - (b) Force dowel to left until clear of control stand.

CAUTION: EXERCISE CARE TO PREVENT SPACERS FROM FALLING WHEN DOWEL IS FORCED FROM CONTROL STAND.

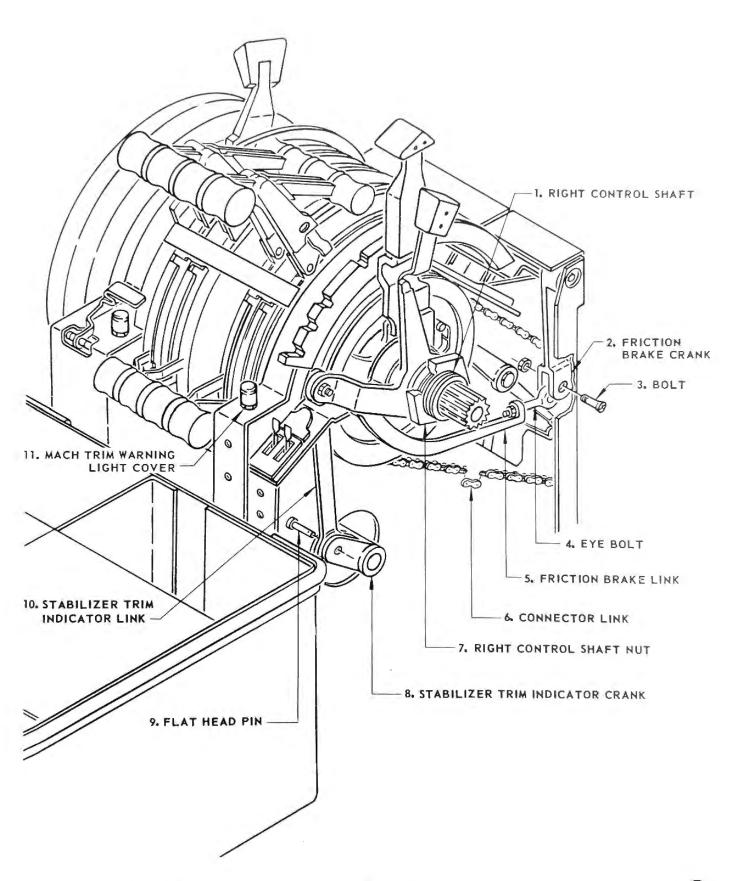
- (7) Insert key (9, figure 202) in left control shaft and upper left side panel.
- (8) Install left control shaft nut (10). Torque nut from 200 to 300 pound-inches.
- (9) With friction brake handle in "OFF" position, brake shoes should just be contacting brake drums. Leaf springs (7, figure 201) may be bent to obtain this position.
- (10) Install stabilizer trim control wheel shaft (5, figure 202) and sprocket (6) in left control shaft (7).
- (11) Place stabilizer trim chain on sprocket and install connector link (6, figure 203).
- (12) Install flap position warning switch actuator arm (4, figure 202) on control stand inter-bulkhead.
- (13) Install cover assemblies (2) on control stand.
- (14) Install mach trim warning light cover (11, figure 203) on cover assembly (2, figure 202).
- (15) Install forward and aft cover angles (3 and 8) on control stand.
- (16) Install forward and aft cover tie straps (1 and 13).
- (17) Install start lever detents (11).
- (18) Install left stabilizer trim control wheel (12) on stabilizer trim control wheel shaft (5).
- (19) Install right control shaft (1) with nut, spacer, stabilizer trim indicator, friction brake handle and flap handle installed.











- (20) Connect eye bolt (4, figure 203) on friction brake link to friction brake crank (2) by installing bolt (3).
- (21) Connect stabilizer trim indicator link (10) to stabilizer trim indicator crank (8) by installing flat head pin (9).
- (22) Remove right control shaft nut (7) from right control shaft (1).
- (23) Attach upper right side panel (9, figure 204). Secure panel with screws on each side only.
- (24) Position splice channel (10) at bottom edge of upper right panel (9) and install bottom screws through upper right side panel and splice channel.
- (25) Install key (2) in upper right side panel (9) and right control shaft (12).
- (26) Install right control shaft nut (3). Torque nut from 200 to 300 pound-inches.
- (27) Install bolt (14) through aft electronic panel and upper right side panel.
- (28) Install switch guard (8).
- (29) Replace forward right electronic unit (13) in aft electronic panel.
- (30) Install right access cover (4) on control stand.
- (31) Install lower right access panel (7) on control stand.
- (32) Install right stabilizer trim control wheel (5) on stabilizer trim control wheel shaft (1).
 - NOTE: Handles on stabilizer trim control wheels should be 90 (± 5) degrees apart when installed on control stand.
- (33) Install stabilizer trim control wheel tie rod (6).
- (34) Install left stabilizer trim control wheel tie rod nut (15).
- (35) In lower nose compartment, tension trim chain assembly by adjusting support linkages to lower forward mechanism. (See figure 205.)
- (36) Check that stabilizer trim indicator position agrees with position of stabilizer. If out of adjustment see 27-10-0, "Adjustment/Test Stabilizer Trim System."

Installation

Of,

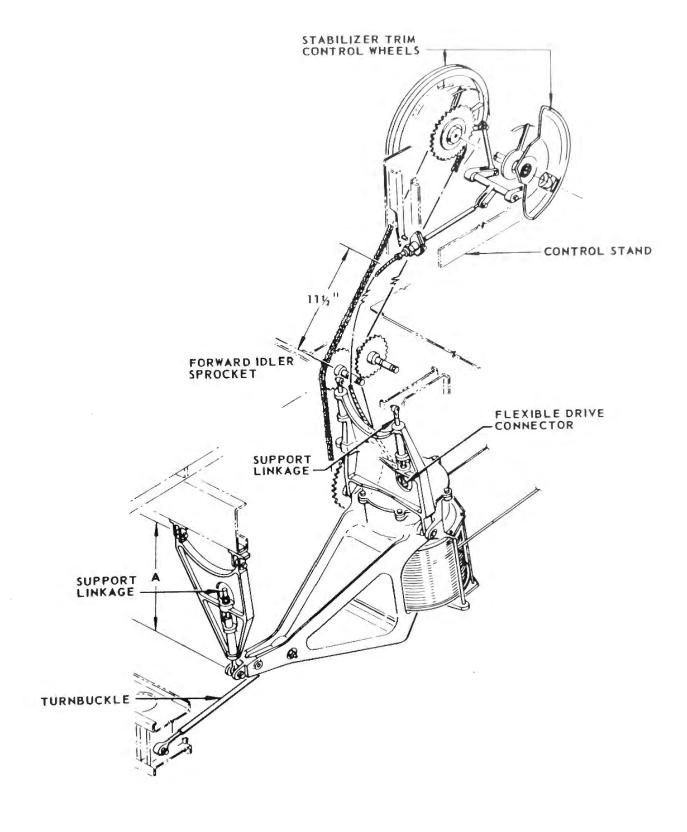
Control Figure

Stand Access 204

MAINTENANCE MANUAL

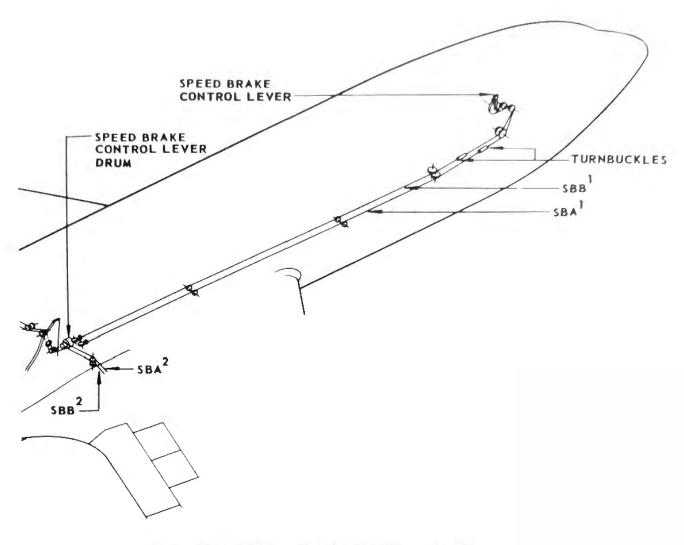
> Thrust Lever Friction Brake ENGINE CONTROLS

2 Aug 15/60 Revised



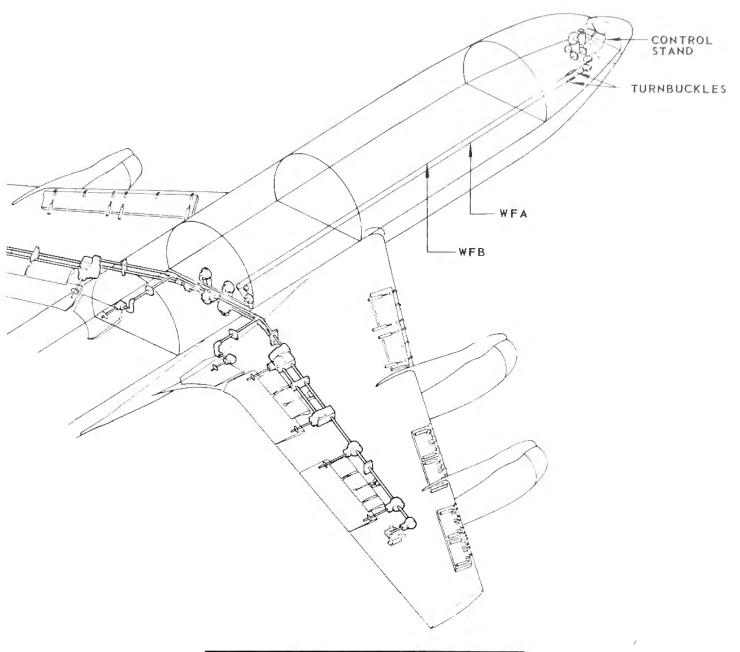


- (37) Tension speed brake control cables by adjusting turnbuckles in lower nose compartment. (See figure 206.)
- (38) Tension wing flap control cables by adjusting turnbuckles in lower nose compartment. (See figure 207.)
- (39) Connect thrust control cables for engines No. 3 and No. 4. Tension all thrust control cables by adjusting turnbuckles. (See figure 208.)
- (40) Tension all engine start cables by adjusting turnbuckles.
- (41) Remove rigging pin from center speed brake control drum and drum support in right wheel well. (See figure 209.)
- (42) On AA 707-123 and QANTAS 707-138 airplanes remove rigging pin from each thrust reverser control drum and hanger and each engine start arm and bracket. (See figure 210.)
- (43) On AA 707-123B and QANTAS 707-138B airplanes remove rigging pin from each thrust reverser main valve actuating cam and strut bracket and each engine start crank and bracket. (See figure 210.)
- (44) On AA 707-123 and QANTAS 707-138 airplanes remove rigging pins from each control valve support bracket and follow-up cable drum. (See figure 211.)
- (45) Replace nacelle strut access panels.
- (46) Close right engine cowl panel.



TEMP	RIGGING LOAD LE (± 10 LB)
110	119
90	111
70	100
50	92
30	84
10	75
-10	67
-30	59
-30 -40	53





TEMP F	RIGGING LOAD ± 10 LB WFA, WFB
110	73
90	61
70	50
50	40
30	32
+10	25
-10	19
-30	15
-40	14

Maintenance Practices Thrust Lever Friction Brake

MAINTENANCE

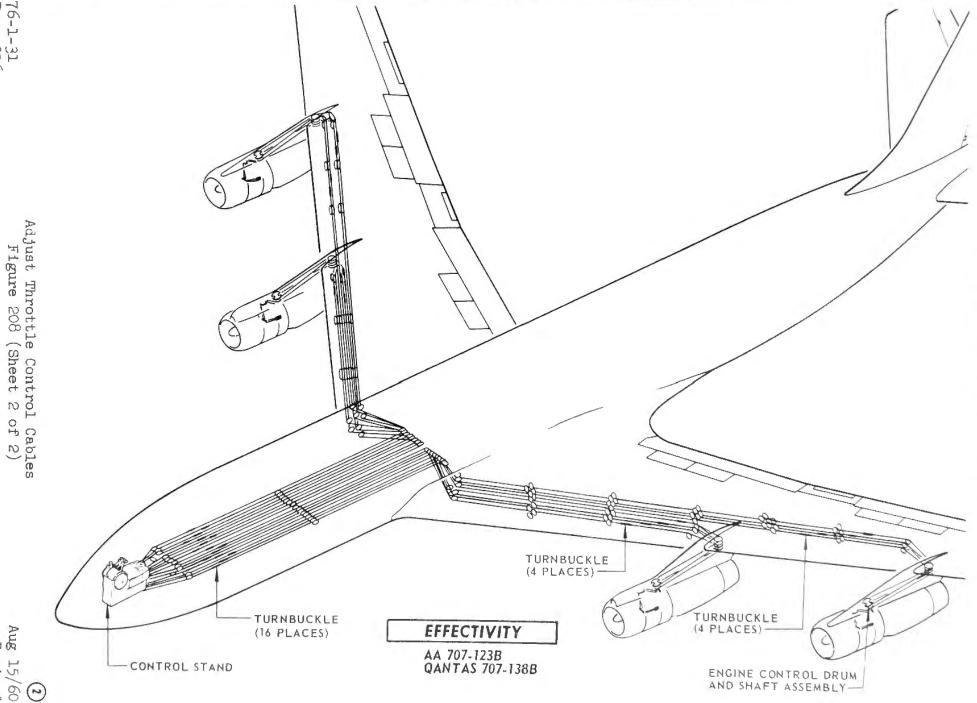
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ENGINE CONTROLS

76-1-31 Page 215

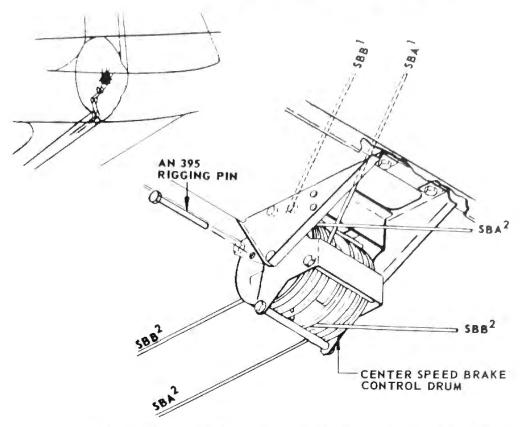
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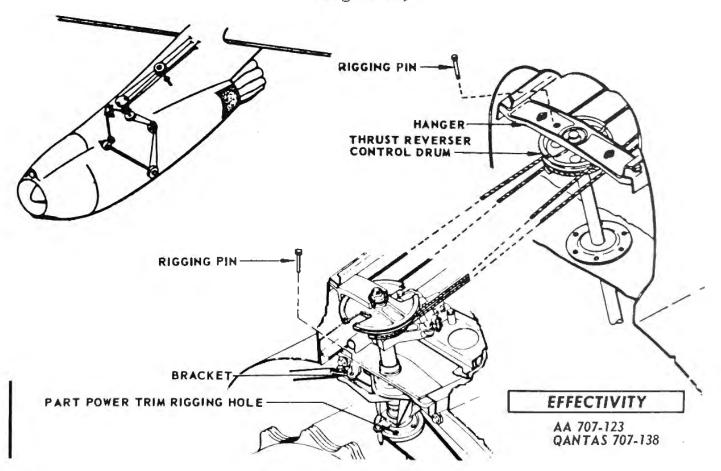
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> Thrust Lever Friction Brake Maintenance Practices FNGINE CONTROLS



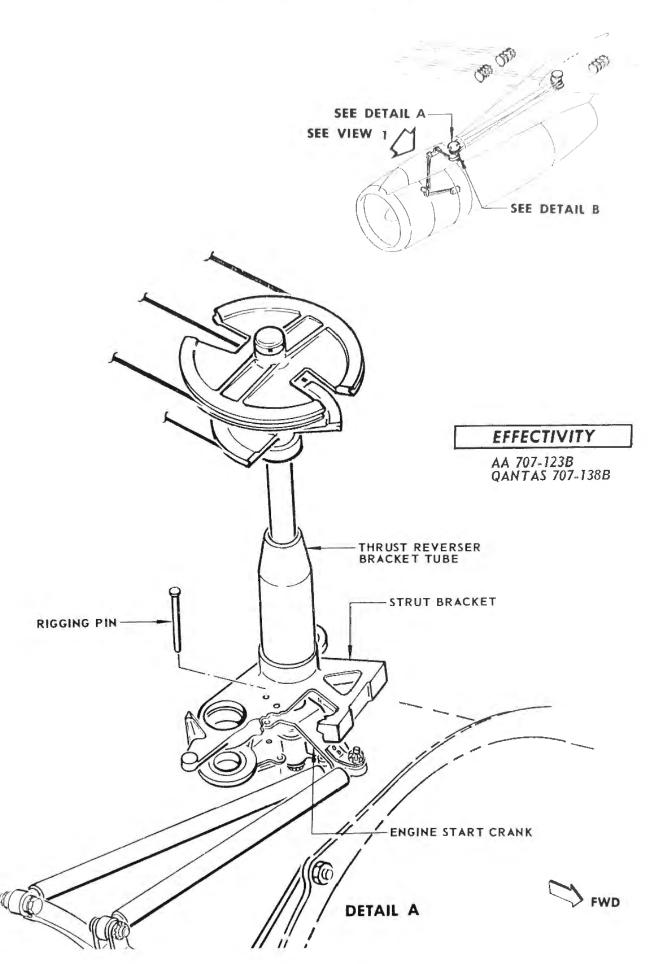


Center Speed Brake Control Drum Rigging Pin Installation Figure 209



Throttle System Rigging Pin Installation Figure 210 (Sheet 1 of 3)

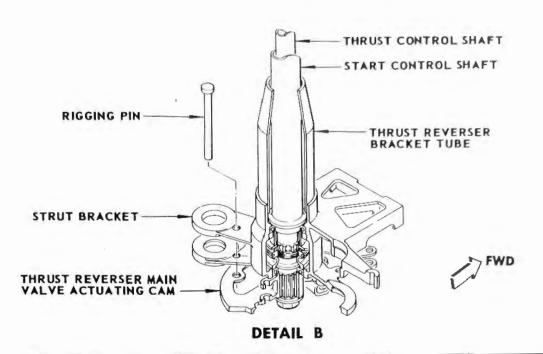


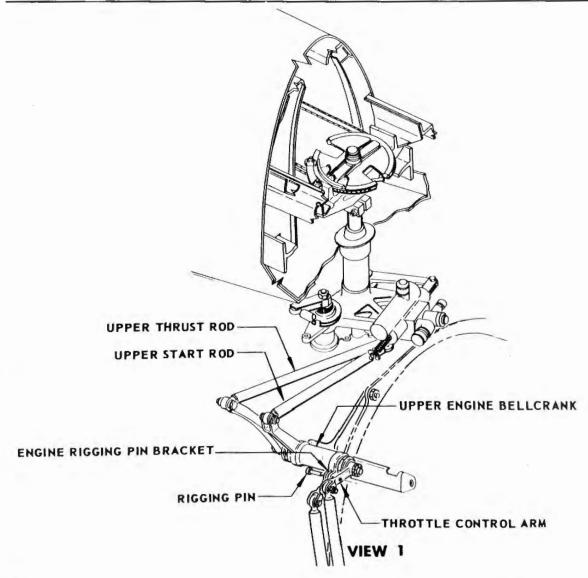


Throttle System Rigging Pin Installation Figure 210 (Sheet 2 of 3)

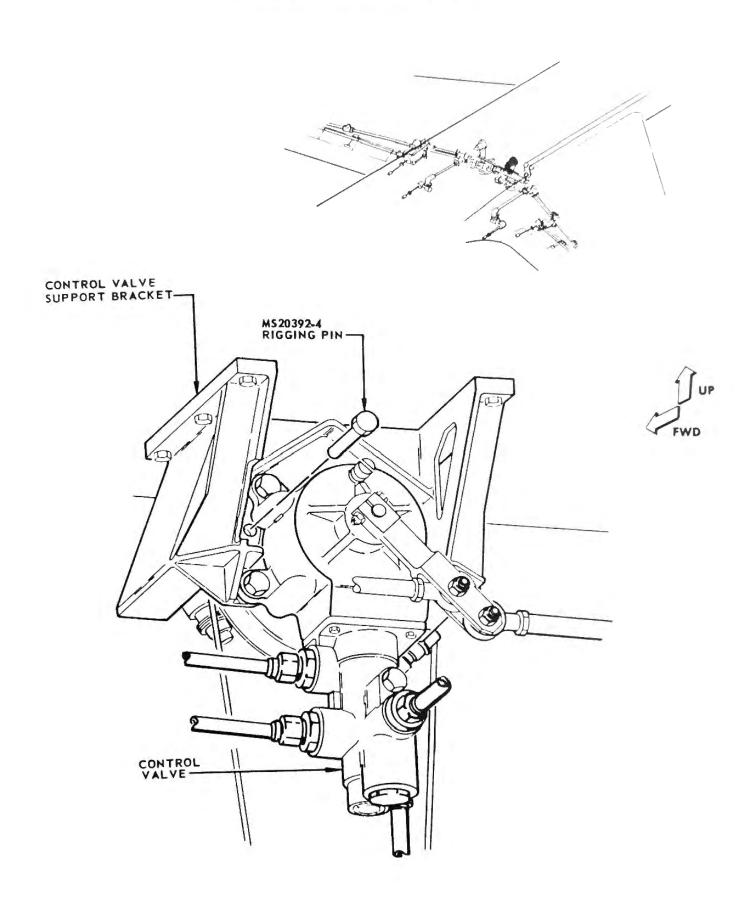
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ENGINE CONTROL DRUM AND SHAFT ASSEMBLY - MAINTENANCE PRACTICES

EFFECTIVITY

AA 707-123 QANTAS 707-138

1. Approved Repairs Engine Control Drum and Shaft Assembly

A. General

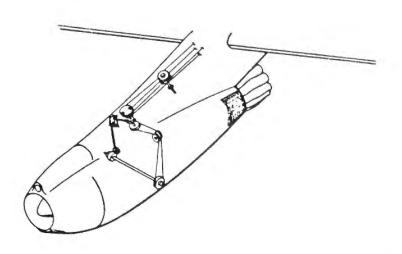
- (1) The following procedure is directed toward replacement of the most inaccessible bearings, however all bearings can be replaced by following the applicable steps. This procedure cannot be completed with the power plant in position.
- B. Equipment and Materials
 - (1) Tensiometer, 0-100 pounds capacity
 - (2) Rigging pins MS20392 or equivalent
- C. Replace Bearings Outboard Engine Control Drum and Shaft Assembly
 - (1) Remove power plant. See Chapter 71, "Power Plant."
 - (2) Remove access panels 739, 740 and 742 from nacelle struts. See Chapter 12, "Access Doors and Panels."
 - (3) Insert rigging pin or AN5 bolt through thrust reverser control drum and hanger. (See figure 201.)
 - (4) Remove throttle control cables from throttle control shaft drums. (See figure 202.)
 - (5) Disengage engine start shaft.
 - (a) Remove engine start cable from engine start shaft drum.
 - (b) Disconnect control rod from engine start arm.
 - (6) on AA airplanes, remove supplemental engine fuel shutoff valve linkage (4) from engine start shaft.
 - (7) Remove lock ring and nut (11) from lower end of throttle control shaft (2).

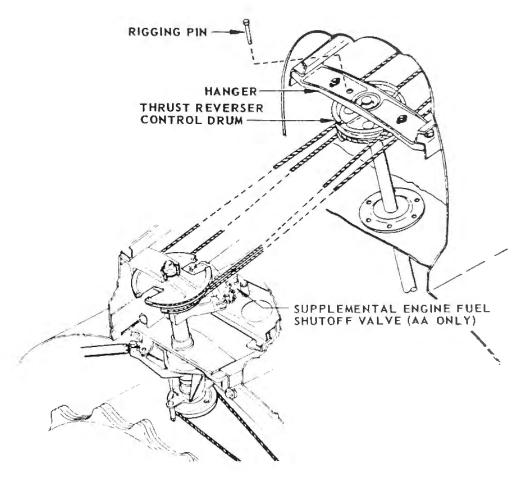


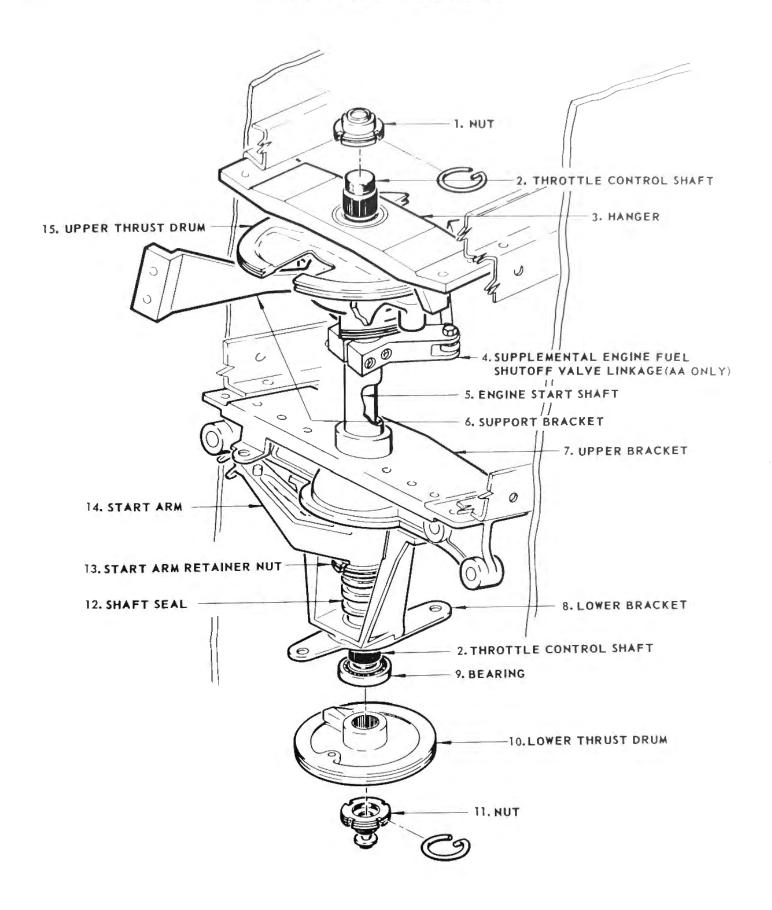
ENGINE CONTROLS

Engine Control Drum
and Shaft Assembly

Maintenance Practices

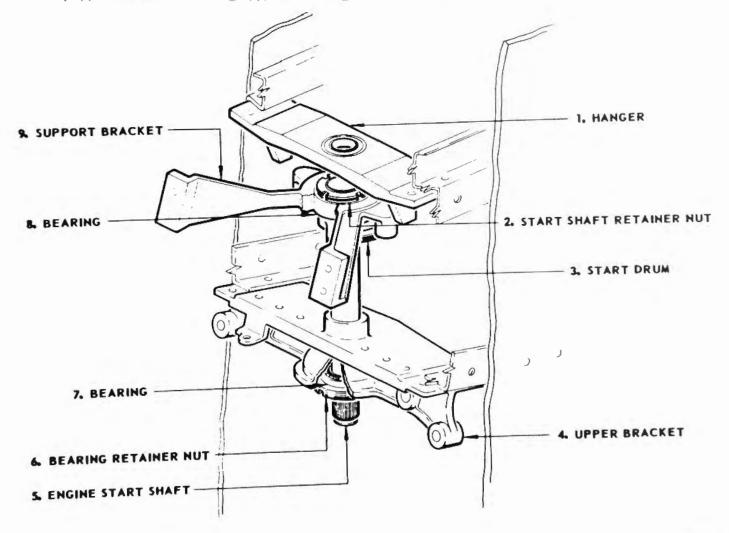








- (8) Remove lower thrust drum (10) and bearing (9).
- (9) Remove lock ring and upper nut (1) from throttle control shaft.
- (10) Lower throttle control shaft until clear of upper thrust drum (15) and remove thrust drum.
- (11) Remove throttle control shaft by lowering clear of concentric engine start shaft (5).
- (12) Remove lower bracket (8) by removing bolts from upper bracket (7).
- (13) Loosen clamp and remove shaft seal (12) from engine start shaft (5).
- (14) Remove lock ring and engine start arm retainer nut (13).
- (15) Remove engine start arm (14) from engine start shaft. Bearing spacer will be free to fall when start arm is removed.
- (16) Remove bearing retainer nut (6, figure 203) from bracket (4).
- (17) Remove bearing (7) from engine start shaft (5).



- (18) Remove lock ring and nut (2) from engine start shaft. Shaft must be supported after removal of nut (2).
- (19) Lower engine start shaft below support bracket (9) and remove bearing (8).
- (20) Install new bearing on engine start shaft (5) above start drum (3).
- (21) Raise engine start shaft through support bracket (9) and install nut (2) and lock ring.
- (22) Install bearing (7) on engine start shaft and install bearing retainer nut (6) in place in lower bracket (4).
- (23) Install spacer and start arm (14, figure 202) on engine start shaft (5).
- (24) Secure engine start arm by installing engine start arm retainer nut (13) and lock ring on engine start shaft.
- (25) Place shaft seal (12) around engine start shaft and secure in place with clamp.
- (26) Install lower bracket (8) to upper bracket (7).
- (27) Position upper thrust drum (15) between support bracket (6) and hanger (3).
- (28) Install throttle control shaft (2) through bottom of engine start shaft (5) and raise through support bracket (6), prepositioned thrust drum (15), and hanger (3).
- (29) Secure throttle control shaft by installing nut (1) and lock ring.
- (30) Install bearing (9) around throttle control shaft.
- (31) Install lower thrust drum (10) on throttle control shaft.
- (32) Secure lower thrust drum by installing nut (11) and lock ring on throttle control shaft.
- (33) On AA airplanes, install supplemental engine fuel shutoff valve linkage (4) on engine start shaft.
- (34) Replace and tension engine start cable. (See figure 204.)

	TEMPERATURE (degrees fahrenheit)	CABLE RIGGING LOAD - (pounds ±5)	CABLE RIGGING LOAD (POUNDS ± 5)
	110	70	51
	90 70	60 50	45 40
	50	42	34
$\overline{}$. 30 10	34 27	26 16
	-10	23 21	10
	- 30 - 40	20	8
		1	
	•		
	1	//	
	/ &	7	7
	TURNBUCKLE	(4 PLACES)	
	3 0	3 3	
CONTROL STAND			
		THRUST REVE	RSER 3
TURNBUCKLE (4	PLACES) ————————————————————————————————————	CONTROL UNI	5) / 3/
DRUM-A	AND-SHAFT	/	
ASSEM	BL1		
TURNBUCKLE (16 PLACES)		> AA N7501A THRU N	7510A
	2	> AA N7511A AND ON	

QANTAS VH-EBA AND ON

MAINTENANCE MANUAL

Engine Control Drum and Shaft Assembly

ENGINE CONTROLS

Maintenance Practices

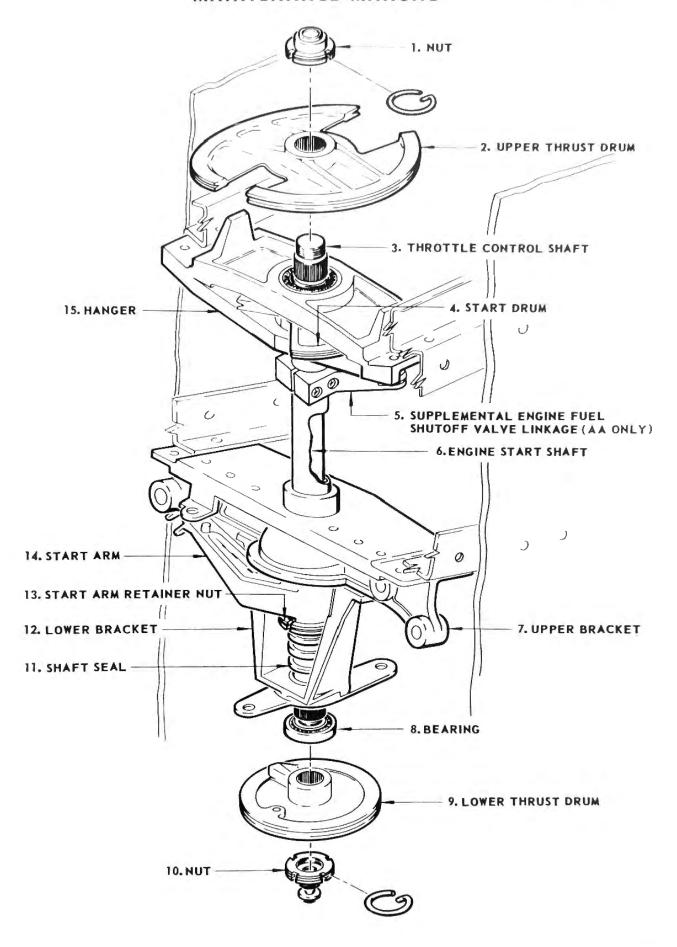
- (35) Replace adjustable control rod.
- (36) Replace and tension throttle control cables.
- (37) Remove rigging pins from thrust reverser control drum and hanger. (See figure 201.)
- (38) Replace access panels 739, 740 and 708 on nacelle struts. See Chapter 12, "Access Doors and Panels."
- (39) Replace power plant. See Chapter 71, "Power Plant."
- D. Replace Bearings Inboard Engine Control Drum and Shaft Assembly
 - (1) Remove power plant. See Chapter 71, "Power Plant."
 - (2) Remove access panels 704, 705 and 708 from nacelle struts. See Chapter 12, "Access Doors and Panels."
 - (3) Insert rigging pin or AN5 bolt through thrust reverser control drum and hanger. (See figure 201.)
 - (4) Remove throttle control cables from throttle control shaft drums. (See figure 205.)
 - (5) Disengage engine start shaft.
 - (a) Remove engine start cable from engine start shaft drum.
 - (b) Disconnect control rod from engine start arm.
 - (6) On AA airplanes, remove supplemental engine fuel shutoff valve linkage (5) from engine start shaft.
 - (7) Remove lock ring and nut (10) from lower end of throttle control shaft (3).
 - (8) Remove lower thrust drum (9) and bearing (8) from throttle control shaft.
 - (9) Remove lock ring and nut (1) from throttle control shaft. Shaft must be supported when nut (1) is removed.
 - (10) Remove upper thrust drum (2) from throttle control shaft.

Revised

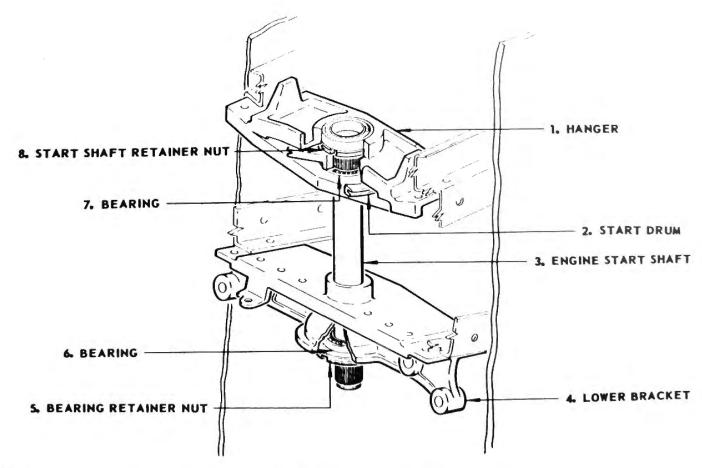
ENGINE CONTROLS

Engine Control Drum
and Shaft Assembly

| Maintenance Practices



- (11) Remove throttle control shaft lowering clear of concentric engine start shaft (6).
- (12) Remove lower bracket (12) from upper bracket (7) by removing bolts.
- (13) Loosen clamp and remove shaft seal (11) from engine start shaft (6).
- (14) Remove lock ring and engine start arm retainer nut (13).
- (15) Remove engine start arm (14) from engine start shaft. Start arm spacer will be free to fall when start arm is removed.
- (16) Remove bearing retainer nut (5, figure 206) and bearing (6) from engine start shaft.
- (17) Remove lock ring and nut (8) from engine start shaft. Shaft must be supported after removal of nut (8).
- (18) Lower start shaft until clear of start drum (2) and remove start drum from hanger (1).
- (19) Lower start shaft until clear of hanger (1).
- (20) Remove bearing (7) from engine start shaft.
- (21) Install new bearing on engine start shaft.





- (22) Position start drum (2) in hanger (1).
- (23) Raise engine start shaft through hanger (1) and start drum (2).
- (24) Secure engine start shaft by installing nut (8) and lock ring.
- (25) Install bearing (6) and retainer nut (5) in lower bracket (4).
- (26) Install start arm spacer and engine start arm (14, figure 205) on start shaft.
- (27) Secure start arm by installing engine start arm retainer nut (13) and lock ring.
- (28) Place shaft seal (11) around engine start shaft and secure with clamp.
- (29) Attach lower bracket (12) to upper bracket (7) by installing bolts.
- (30) Install throttle control shaft (3) through bottom of start shaft (6) and raise through hanger (15). Shaft must be held in place until step (32) is completed.
- (31) Install upper thrust drum (2) on throttle control shaft.
- (32) Secure throttle control shaft by installing nut (1) and lock ring.
- (33) Install bearing (8) around throttle control shaft.
- (34) Install lower thrust drum (9) on throttle control shaft.
- (35) Secure lower thrust drum by installing nut (10) and lock ring on throttle control shaft.
- (36) On AA airplanes, install supplemental engine fuel shutoff valve linkage (5) on engine start shaft.
- (37) Replace and tension engine start cable. (See figure 204.)
- (38) Attach adjustable control rod.
- (39) Replace and tension throttle control cables.
- (40) Remove rigging pins from thrust reverser control drum and hanger. (See figure 201.)
- (41) Replace access panels 704, 705 and 708 on nacelle struts. See Chapter 12, "Access Doors and Panels."
- (42) Replace power plant. See Chapter 71, "Power Plant."

ENGINE CONTROL DRUM AND SHAFT ASSEMBLY - MAINTENANCE PRACTICES

EFFECTIVITY

AA 707-123B Qantas 707-138B

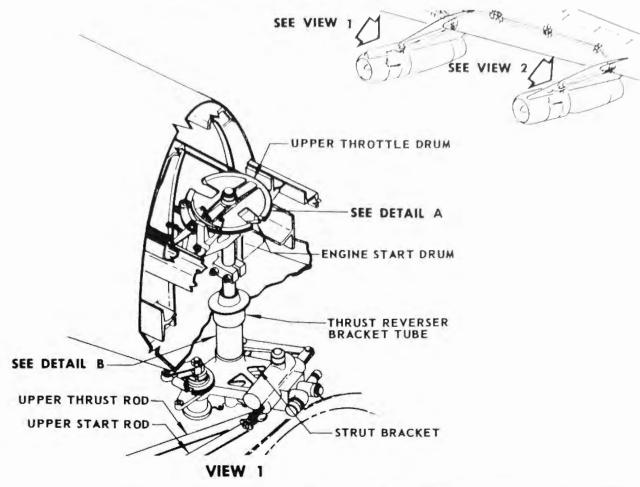
- 1. Removal/Installation Engine Control Drum and Shaft Assembly.
 - A. General
 - (1) The engine control drum and shaft assemblies for the inboard and outboard engines are identical except for differences in mounting brackets. Therefore, only one procedure for removal/installation is given.
 - (2) No detailed procedure for installing new bearings in the engine control drum and shaft assembly is given; however, during installation of the drum and shaft assembly new bearings may be installed as necessary.
 - B. Equipment and Materials
 - (1) Tensiometer, 0-100 pounds capacity.
 - C. Remove Engine Control Drum and Shaft Assembly.
 - (1) Remove power plant. See Chapter 71, "Power Plant."
 - (2) Remove access panels 1739 or 3716 from nacelle strut. See Chapter 12, "Access Doors and Panels."
 - (3) Clamp thrust levers in idle no load position.
 - (4) Clamp start levers in cutoff no load position.
 - (5) Loosen engine control cables by use of turnbuckles in wiring leading edge.
 - (a) For access to turnbuckles in wing leading edge, lower wing leading edge flaps.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."

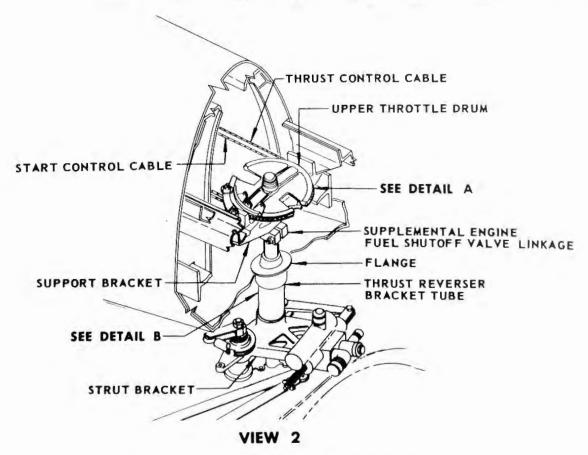


- 3) Install leading edge flap down locks on flaps Nos. 1, 2, 3 and 4.
 - NOTE: Access to turnbuckles for inboard engines is under flaps No. 1 and 2. Access to turnbuckles for outboard engines is under flaps No. 3 and 4.
- (6) Insert rigging pin through upper engine bellcrank, engine rigging pin bracket and throttle control arm. (See figure 201.)
- (7) Remove throttle control cables from upper throttle drum (6).
- (8) Remove engine start cables from engine start drum (10).
- (9) Remove supplemental engine fuel shutoff valve linkage from engine start shaft (2).
- (10) Disconnect upper thrust rod from thrust reverser main valve actuating cam (19).
- (11) Disconnect upper start rod from engine start shaft crank (16).
- (12) Break lockwire and remove throttle shaft plug (18) from lower end of throttle control shaft (8).
- (13) Remove thrust reverser main valve actuating cam (19) from lower end of throttle control shaft (8).
- (14) Remove throttle control shaft lower bearing (20) from throttle control shaft (8).
- (15) Remove lock ring (5) and remove cap nut (7) from upper end of throttle control shaft (8).
- (16) Remove upper throttle drum (6) from throttle control shaft (8).
- (17) Remove throttle control shaft (8) by lowering clear of concentric engine start shaft (2).
- (18) Remove throttle control shaft upper bearing (4) from support bracket (3).
- (19) Remove lockring (5) and remove engine start drum retaining nut (9) from engine start shaft (2).
- (20) Remove shaft seal (17) from lower end of engine start shaft (2).

- (21) Remove engine start shaft nut (21) from lower end of engine start shaft (2).
- (22) Remove spacer (23) from engine start shaft.
- (23) Remove engine start shaft crank (16) from engine start shaft (2).
- (24) Remove spacer (15) from engine start shaft (2).
- (25) Remove engine start nut (14) from strut bracket (13).
- (26) Remove engine start shaft lower bearing (24).
- (27) Lower engine start shaft (2) until clear of upper support bracket (3) and remove engine start drum (10).
- (28) Remove engine start shaft upper bearing (11).
- (29) Remove engine start shaft (2) by lowering through thrust reverser bracket tube (12).
- D. Install Engine Control Drum and Shaft Assembly.
 - (1) Position engine start shaft (2 figure 201.) inside thrust reverser bracket tube (12) leaving upper end of shaft below upper support bracket (3).
 - (2) Place engine start shaft upper bearing (11) in position on engine start shaft (2).
 - (3) Position engine start drum (10) inside upper support bracket (3) and push engine start shaft (2) upward through drum (10).
 - (4) Install engine start drum retaining nut (9) on engine start shaft and install lock ring (5) on nut.
 - (5) Install engine start shaft lower bearing (24) on engine start shaft (2).
 - (6) Install engine start nut (14) in strut bracket (13).
 - (7) Position spacer (15) around shaft (2) below lower bearing (24) and install engine start shaft crank (16) on engine start shaft (2).
 - (8) Position spacer (23) around shaft (2) below crank (16) and install engine start shaft nut (21) on shaft.

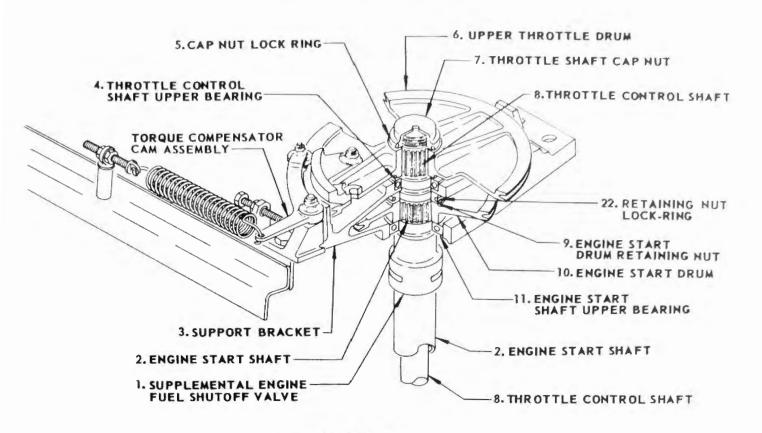




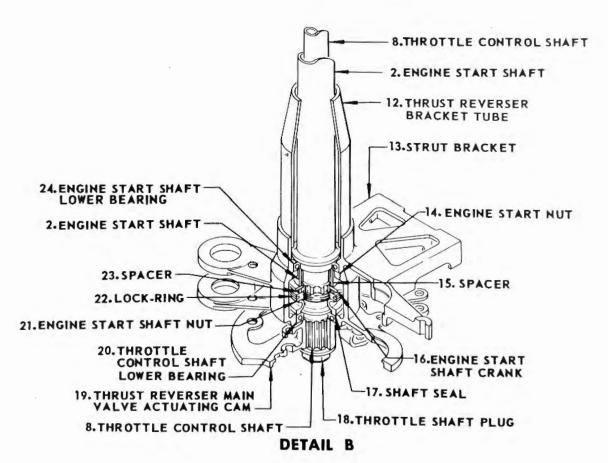


Engine Control Drum and Shaft Assembly Figure 201 (Sheet 1 of 2)











- (9) Install lock ring (22) on engine start shaft nut (21).
- (10) Install throttle control shaft (8) in mounting position by inserting upward through concentric engine start shaft (2).
- (11) Position throttle control shaft upper bearing (4) around throttle control shaft (8) in upper support bracket (3).
- (12) Mount upper throttle drum (6) on splines on throttle control shaft (8).
- (13) Install throttle shaft cap nut (7) on throttle control shaft (8).
- (14) Install lock ring (5) on throttle shaft cap nut (7).
- (15) Install shaft seal (17) on lower end of engine start shaft (2).
- (16) Position throttle control shaft lower bearing (20) around shaft (8) and against shaft seal (17).
- (17) Install thrust reverser main valve actuating cam (19) on throttle control shaft (8).
 - NOTE: New bearings may be installed on cam before installation if desired.
- (18) Install throttle shaft plug (18) on lower end of throttle control shaft (8) and lockwire.
- (19) Attach upper start rod to engine start shaft crank (16).
- (20) Attach upper thrust rod to thrust reverser main valve actuating cam (19).
- (21) Attach supplemental engine fuel shutoff valve linkage to engine start shaft (2).
- (22) Replace engine start cables on engine start drum (10).
- (23) Replace throttle control cables on upper throttle drum (6).
- (24) Remove rigging pin from upper engine bellcrank.
- (25) Remove clamps from engine start levers.
- (26) Remove clamps from engine thrust levers.
- (27) Replace access panels. See Chapter 12, "Access Doors and Panels."
- (28) Replace power plant. See Chapter 71, "Power Plant."
- (30) Adjust throttle system. See adjust throttle system, 76-2-0.

ENGINE CONTROL BELL CRANK ASSEMBLY - MAINTENANCE PRACTICES

EFFECTIVITY

AA 707-123B Qantas 707-138B

1. Removal/Installation Engine Control Bell Crank Assembly

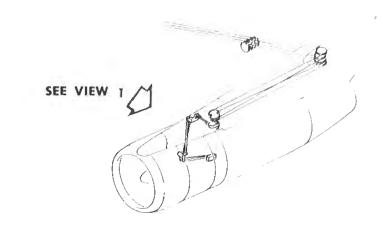
A. General

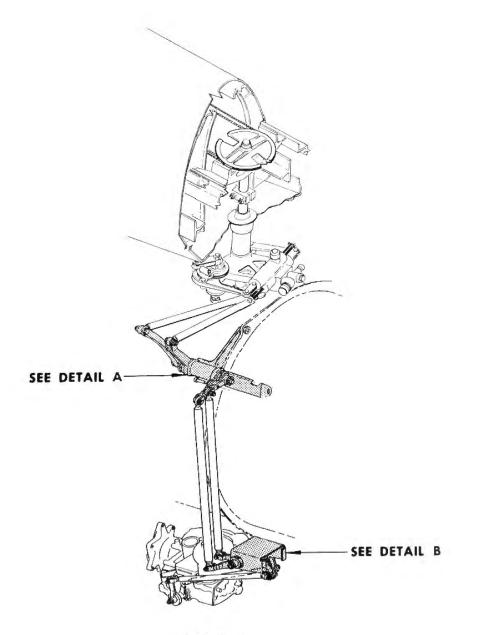
- (1) Two bell crank assemblies are mounted on each engine. Since these assemblies are identical in appearance and operation except for crank arms and supporting structure, only one procedure for removal/installation is given.
- B. Remove Engine Control Bell Crank Assembly. (See figure 201.)
 - (1) Open engine right cowl panels.
 - (2) Install rigging pin through support bracket and thrust reverser main valve actuating cam on engine control drum and shaft assembly.
 - (3) Install rigging pin through support bracket and engine start crank on engine control drum and shaft assembly.
 - (4) Detach engine start and thrust control rods from bell crank assembly.

NOTE: Air ducts may be disconnected as necessary for access.

- (5) Release fasteners attaching bell crank assembly to supporting structure and remove bell crank assembly.
- C. Install Engine Control Bell Crank Assembly. (See figure 201.)
 - (1) Support bell crank assembly in mounting position and install retaining bolts.
 - (2) Connect engine start and thrust control rods to bell crank assembly.
 - (3) Remove rigging pins.
 - (4) Close engine cowl panel.

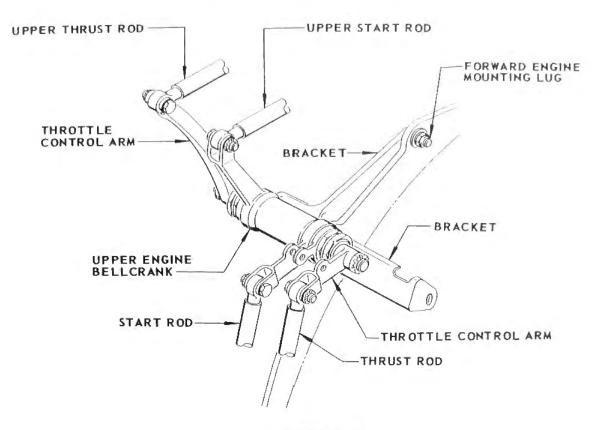






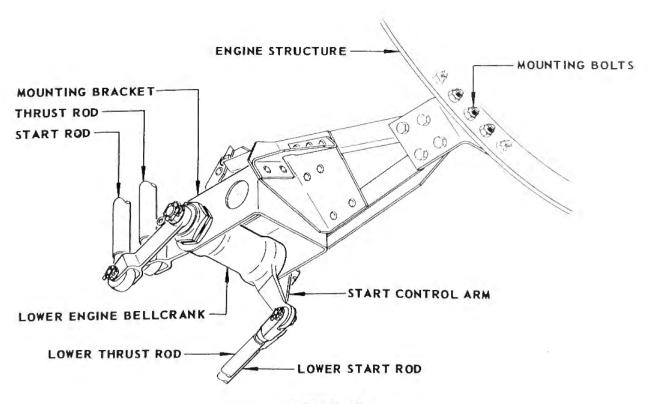
VIEW 1





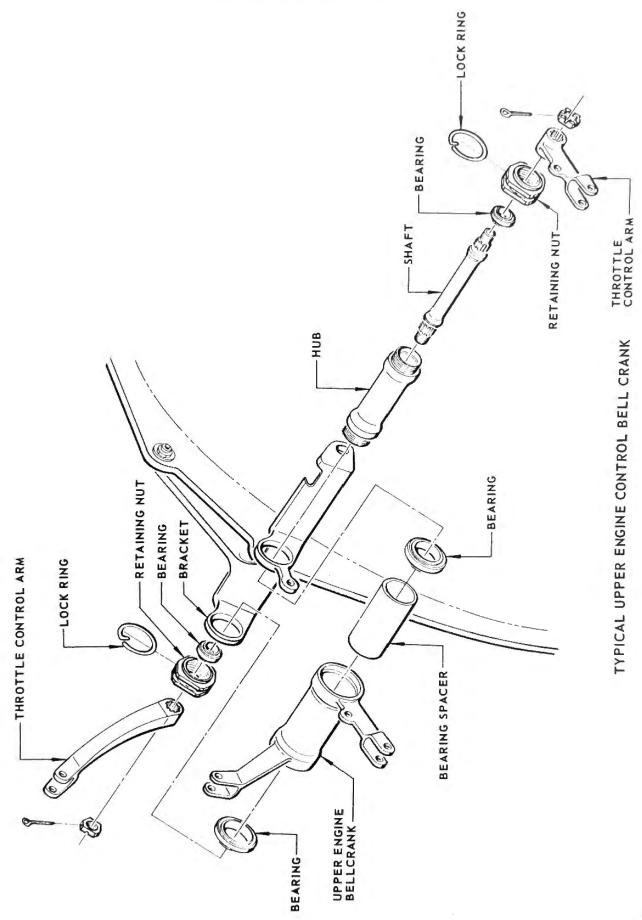
DETAIL A

TYPICAL UPPER ENGINE CONTROL BELL CRANK

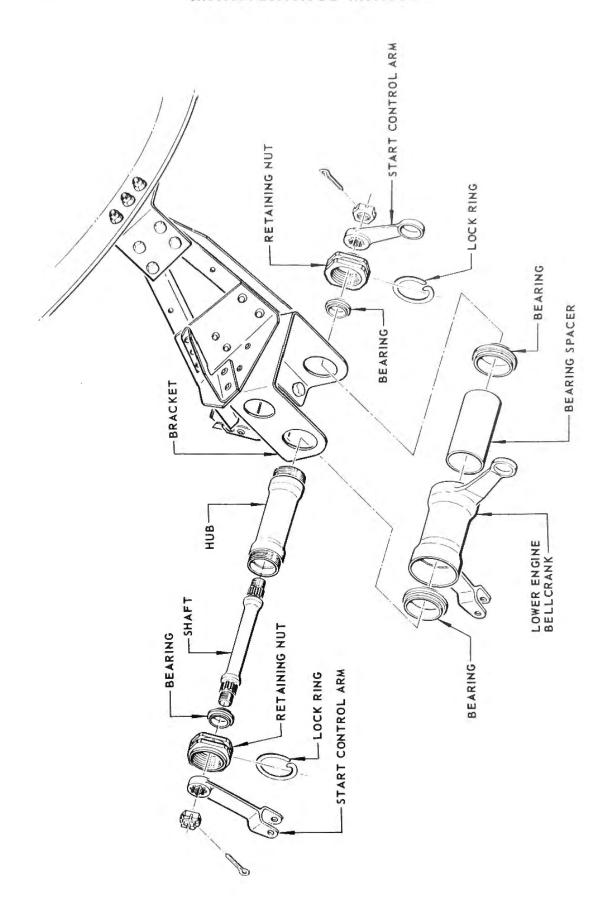


TYPICAL LOWER ENGINE CONTROL BELL CRANK





Replace Bearing Engine Control Bellcrank Figure 202 (Sheet 1 of 2)



2. Approved Repairs Engine Control Bell Crank Assembly.

- A. Replace Bearings Engine Control Bell Crank Assembly. (See figure 202.)
 - (1) Remove bell crank assembly from engine.
 - (2) Remove retaining nut from each end of bell crank shaft and remove arm from each end of shaft.
 - (3) Remove bearing from each end of bell crank shaft and remove shaft.
 - (4) Remove retaining nut lock ring and retaining nut from each end of bell crank hub.
 - (5) Support bell crank and remove bell crank support shaft.
 - (6) Remove bell crank from mounting bracket.
 - (7) Remove bearing from each end of bell crank.
 - (8) Install new bearing in each end of bell crank.
 - (9) Support bell crank in mounting position inside mounting bracket and install support shaft.
 - (10) Install retaining nut on each end of support shaft.
 - (11) Install lock ring in each retaining nut.
 - (12) Position bell crank thrust control shaft inside support shaft.
 - (13) Install new bearing on each end of support shaft.
 - (14) Position throttle arm on each end of support shaft and install retaining nuts.
 - (15) Install bell crank assembly on engine.

END





THROTTLE SYSTEM - DESCRIPTION AND OPERATION

1. General

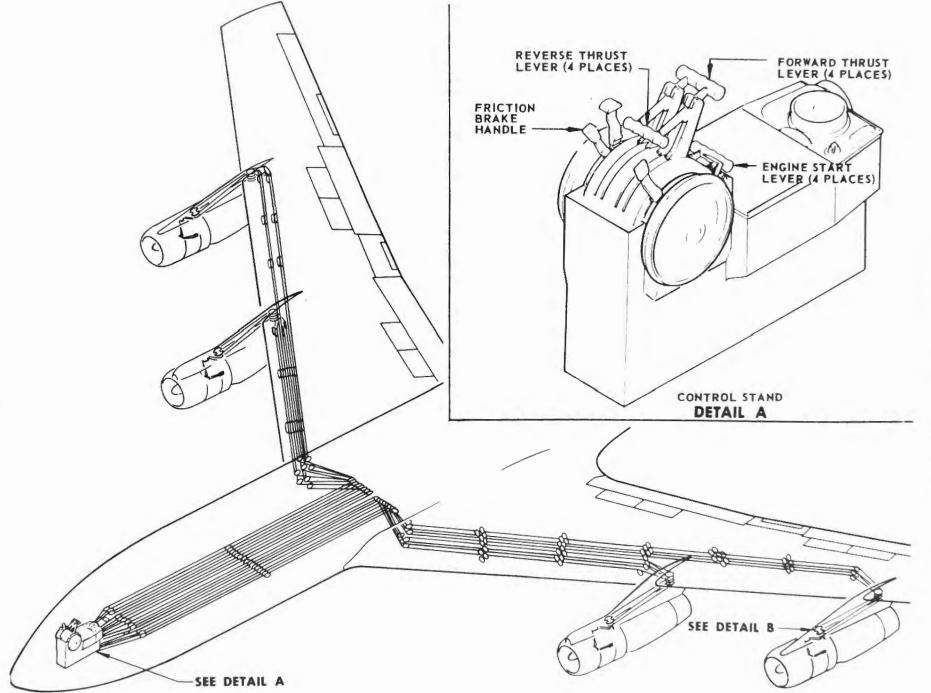
- A. A manually operated throttle system for each engine provides for separate control of engine starting and thrust. Starting of each engine is accomplished by use of a single lever to energize the ignition system and to initiate fuel flow to the engine. Another lever assembly controls both forward and reverse thrust by regulating fuel flow and actuating the thrust reverser. An interlock mechanism prevents simultaneous initiation of forward and reverse thrust for each engine.
- B. The throttle system consists of an engine start lever and a thrust lever assembly for each engine, connected by a series of throttle control cables and mechanical linkages to the fuel control units on the engines. (See figure 1.) A thrust lever friction brake applies a braking force to all thrust lever assemblies during forward thrust operation.
- C. The engine start lever is connected by cables to an engine control drum-and-shaft assembly in the nacelle strut. This control assembly is connected, by a rod-and-bell crank installation on the right side of the engine to the fuel control unit.
- D. Advancing the engine start lever actuates an ignition switch to energize the ignition system. Further movement of the start lever opens a pilot shutoff valve in the fuel control unit.
- E. The thrust lever assembly is connected by cables to the drum-and-shaft assembly in the nacelle strut. The drum-and-shaft assembly is also connected to the fuel control unit by a rod-and-bellcrank installation located on right side of engine.
- F. Actuation of the thrust lever assembly regulates fuel flow in the fuel control unit. For reverse thrust, the lever assembly movement actuates the thrust reverser before increasing fuel flow. It should be noted that the direction of travel of the thrust control cables and drums is the same for decreasing forward thrust as it is for increasing reverse thrust.

2. Thrust Lever Assembly

A. Four thrust lever assemblies on the control stand quadrant control the forward thrust and reverse thrust of the engines. Each thrust lever

Throttle System Figure 1 (Sheet 1 of

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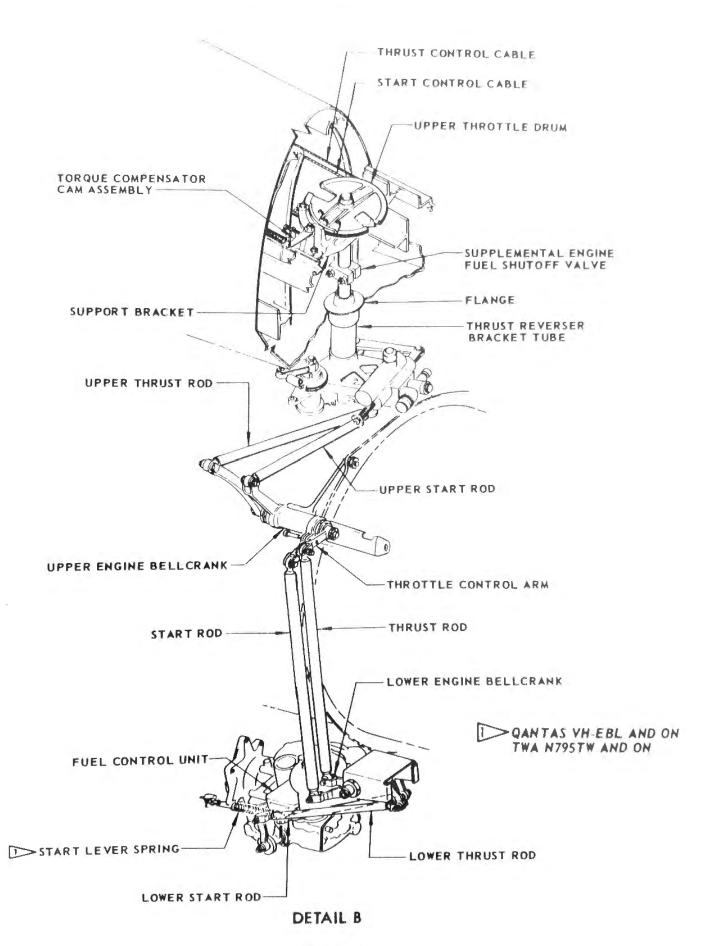


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Throttle System Figure 1 (Sheet 2 of 2)





assembly consists of a forward thrust lever, a reverse thrust lever, a reverse thrust control link, a pawl, a brake drum, and a thrust control drum. (See figure 2.) The forward thrust lever, with the reverse thrust lever attached to it, is mounted on the brake drum. One end of the control link is riveted to the reverse thrust lever and the opposite end is attached to the thrust control drum.

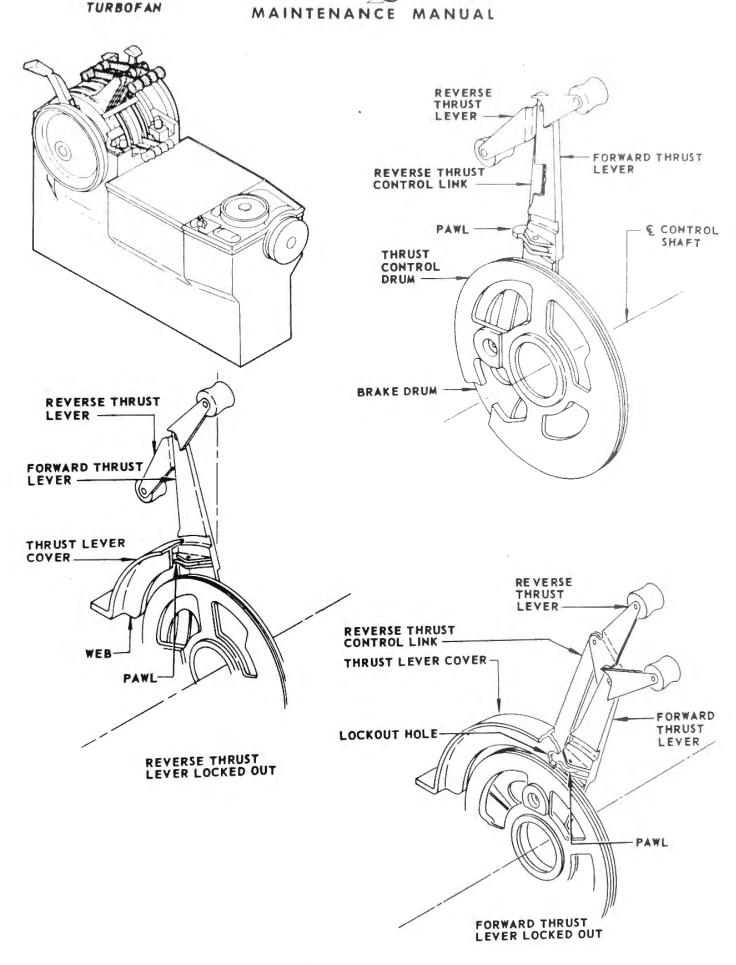
- B. As either thrust lever is advanced from the idle position, the control link rotates the thrust control drum to actuate the fuel control unit to increase thrust. The forward thrust idle position is against an idle stop on the quadrant and full forward thrust is obtained before the lever is all the way forward. The reverse thrust lever, when in the idle position, is against an idle stop on the forward thrust lever.
- C. An interlock mechanism prevents simultaneous actuation of the forward and reverse thrust levers so as to assure positive forward or reverse thrust control. The ability of each lever to move depends on the position of the other lever. If the forward thrust lever is more than two degrees from the idle position, the reverse thrust lever cannot be moved more than 12 degrees from idle. However, if the reverse thrust lever is advanced more than 12 degrees from idle, the forward thrust lever cannot be moved. The interlock between the levers is a pawl, riveted to the forward thrust lever. (See figure 2.) The pawl is between the thrust lever and the control link. When the forward thrust lever is two degrees or less from the idle position, the pawl is aligned with a lockout hole in the web of the thrust lever cover. As the reverse thrust lever is moved from the idle position, the control link forces the pawl into the hole to lock the forward thrust lever in the idle position. As the reverse thrust lever is returned to the idle position the control link pushes the pawl from the hole to unlock the forward thrust lever. When the forward thrust lever is more than two degrees from the idle position, the pawl is not aligned with the lockout hole. The web then opposes the force of the control link on the pawl so that the reverse thrust lever cannot be moved more than 12 degrees from idle.
- D. A torque compensator cam assembly is installed on the upper throttle drum in the nacelle strut. (See figure 1.) The cam is designed to increase the reverse thrust lever forces to counteract the negative torque of the fuel control unit shaft, reducing the probability of the thrust system creeping toward the full reverse thrust position.

3. Engine Start Lever

A. Four engine start levers on the control stand quadrant are used to start engines. Each lever controls energizing the ignition system and initiating fuel flow to the respective engine. The start lever is provided with a spring-loaded detent catch which may be released by lifting the knob. The detent secures the lever in the "CUT-OFF" by "IDLE" positions. An additional detent is provided between the "CUT-OFF" and "IDLE" positions. This catch is to insure that a throttle left insecurely in the "IDLE" position will not creep to the "CUT-OFF" position causing an unintentional engine shutdown. A stop gate and detent is provided at the "START" position.



Stratoliner
MAINTENANCE MANUAL







B. A start lever spring is installed on the lower start rod on QANTAS VH-EBL and on, and TWA N795TW and on. This spring prevents engine cutoff due to the start lever not seating securely in the idle detent.

4. Throttle Control Cables

A. Throttle control cables consist of engine start and thrust cables which connect the fuel control unit on each engine to the respective engine start lever and thrust lever assembly. The cables are routed under the floor from the control stand through the lower nose compartment and above the forward cargo compartment ceiling. (See figure 1.) From the cargo compartment, the cables are routed along the wing leading edge to the nacelle struts. In each strut, the cables are routed to the drumand-shaft assembly which, in turn, is linked to the fuel control unit.

5. Thrust Lever Friction Brake

- A. A thrust lever friction brake on the control stand quadrant applies a variable braking force to all thrust levers during forward thrust operation. (See figure 1.) The friction brake is used to manually select the proper amount of braking force to prevent throttle creep during flight. The friction brake consists of a brake handle mechanically linked to two leaf springs and four brake shoes.
- B. The brake handle, mounted to the right of the thrust levers, is connected by a brake link and an eye bolt to a brake crank. Bolted to the crank are the leaf springs and the brake shoes. As the brake handle is advanced, friction between the brake shoes and the brake drums is increased. A ratchet locks the brake handle in any position.

6. Engine Control Drum-and-Shaft Assembly

- A. An engine control drum-and-shaft assembly in the nacelle strut of each engine is a mechanical link in the throttle system which provides for independent control of the fuel control unit by the thrust and engine start levers.
- B. The drum-and-shaft assembly consists of concentric engine start and thrust control shafts, a thrust control drum, engine start drum, engine thrust control crank, and an engine start crank. (See figure 1.) The start drum and the start crank are mounted on each end of the engine start shaft. The thrust drum and thrust crank are mounted on each end of the thrust control shaft which is mounted inside the start shaft. The assembly is supported by a bracket on the strut aft of the forward engine mount. The start lever contacts the strut bracket to provide a mechanical stop for the engine start control system at "CUT-OFF." A lug on the strut bracket provides a stop for the thrust system at both 100% forward and reverse thrust.



7. Operation

- A. Advancing the engine start lever to the "START" position causes a start control cable cam to actuate an ignition switch in the lower nose compartment. The lever movement also rotates the engine start control shaft which rotates the engine start crank. Motion of the engine start crank is transmitted through a bellcrank assembly to the fuel control unit. On AA airplanes, rotation of the engine start control shaft opens the supplemental engine fuel shutoff valve before the pilot valve opens.
- B. Placing the start lever in "IDLE" de-energizes the ignition system. When the lever is returned toward the "CUTOFF" position, the engine start crank in the drum-and-shaft assembly contacts the support bracket to stop the system motion at the strut. About 4° of additional start lever motion is required to enter the "CUTOFF" detent. This stretches the control cable to provide sufficient load in the cable system to maintain positive engagement of the start lever in the "CUTOFF" detent.
- C. Advancing the forward thrust lever from the idle position, locks the reverse thrust lever in idle and rotates the thrust control shaft. As the shaft rotates, the motion is transmitted to a lever on the fuel control unit. This lever rotates to increase fuel flow to the burners. Forward motion of the forward thrust lever is terminated by a lug on the stut bracket. On the No. 3 engine, forward motion of the forward thrust lever causes a thrust control cable cam to actuate the flap and speed brake and stabilizer trim warning switch in the lower nose compartment.
- D. As the forward thrust lever is returned to the idle position, fuel flow is reduced and a thrust control cable cam actuates the landing gear warning switch. The reverse thrust lever is unlocked.
- E. As the reverse thrust lever is advanced from the idle position, the forward thrust lever is locked out. The thrust control drum on the engine control drum and shaft assembly is rotated causing the thrust reverser main valve actuating cam to be rotated. This cam will continue to rotate with increased travel of the reverse thrust lever until it contacts the fan and aft thrust reverser locking cams. The locking cams are contacted at about one fourth of full reverse thrust lever travel. Further increase in reverse thrust is prevented at this point until both the fan and aft thrust reversers move aft to the closed position. Closing of the thrust reversers causes the thrust reverser control locking cams to be repositioned and frees the reverse thrust lever for travel to the full reverse thrust position. Under normal operation only a slight delay in lever operation will be experienced when the reverser thrust lever contact the locking cams. See Chapter 78, "Thrust Reverser Control System."

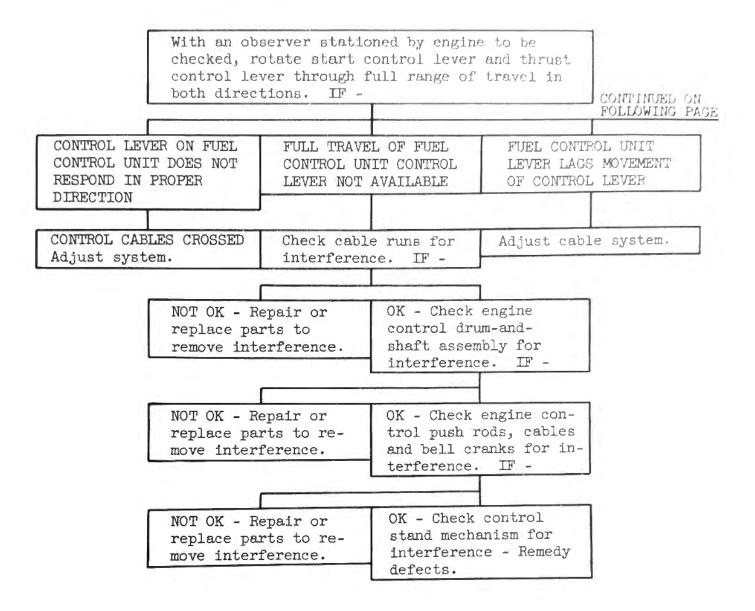


F. As the reverse thrust lever is returned to the idle position, the clamshell doors are rotated outboard and forward and the forward thrust lever is unlocked. If the clamshell doors do not open, forward motion of the forward thrust levers is blocked at approximately 8° from idle by the follow-up control stop.

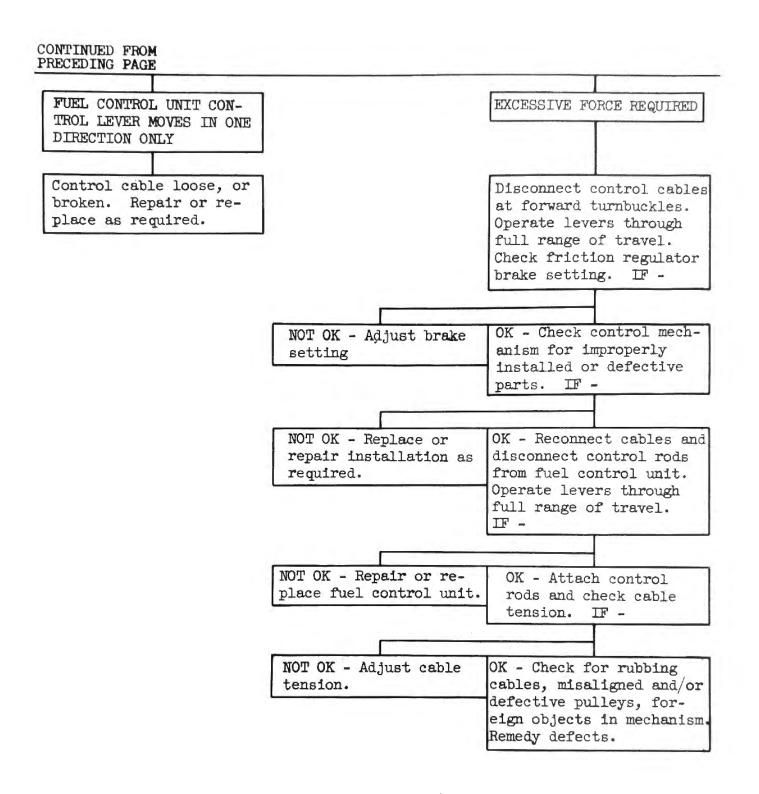


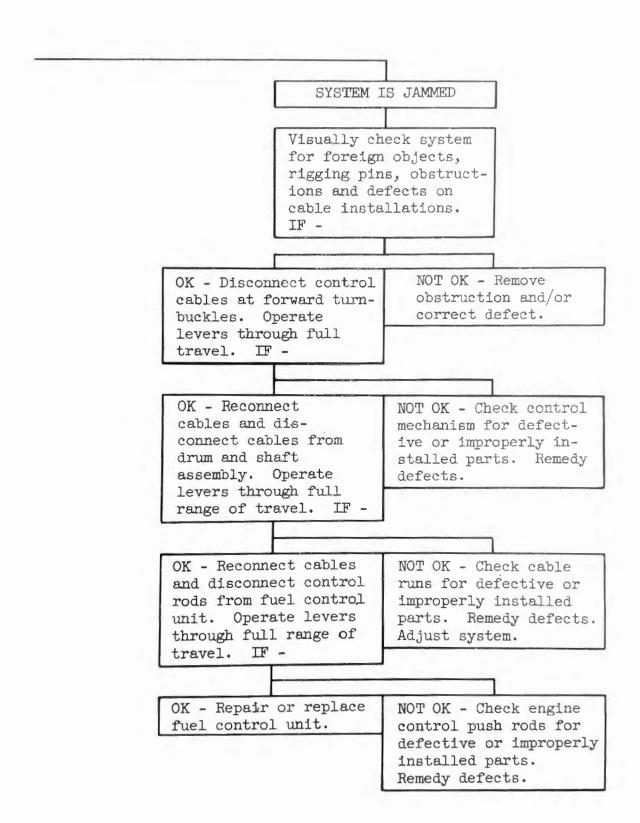


THROTTLE SYSTEM - TROUBLE SHOOTING











THROTTLE SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Throttle System

- A. Lubricate Throttle System Linkage (Relubrication of bearings containing MIL-G-25013C Extreme Hi Temperature Grease.)
 - (1) Seizure and binding of the strut and engine mounted throttle system bearings is generally caused by evaporation of the oil in the extreme hi temperature grease (blue-purple colored) with which the bearings are lubricated. Periodically replenishing the silicone fluid in the bearings will rejuvenate the grease and eliminate the necessity of replacing or repacking the bearings. (See figure 201.)

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	ROD END BEARINGS	Apply fluid > to bearings. (8 places each engine.)
2	CRANK BEARINGS	Apply fluid > to bearings. (2 places each engine.)
3	START CONTROL SHAFT LOWER BEARING	Apply fluid > through space between start control shaft and thrust reverser bracket tube. (1 place each strut.)
4	THRUST CONTROL SHAFT LOWER BEARING	Lift teflon fire seal and apply fluid > to bearing. (1 place each strut.)
5	UPPER ENGINE BELLCRANK	Apply fluid > to bearings. (4 places each engine.)
6	LOWER ENGINE BELLCRANK	Apply fluid > to bearings. (4 places each engine.)

Silicone fluid, Dow Corning 550 or Silicone fluid, Dow Corning 510; -100, -500 or -1000 Centistoke. Source: Dow Corning Chemical Company; Midland, Michigan.

NOTE: The presence of the seals on the bearings may not allow the fluid to readily enter the bearing; therefore, thinning the fluid with a highly volatile solvent will aid getting the fluid into the bearing. If thinning the fluid is desired, it may be thinned in the following proportions with DuPont Freon TE or Freon TA solvent (Source: E.I. DuPont de Nemours, Inc.; Wilmington, Delaware).

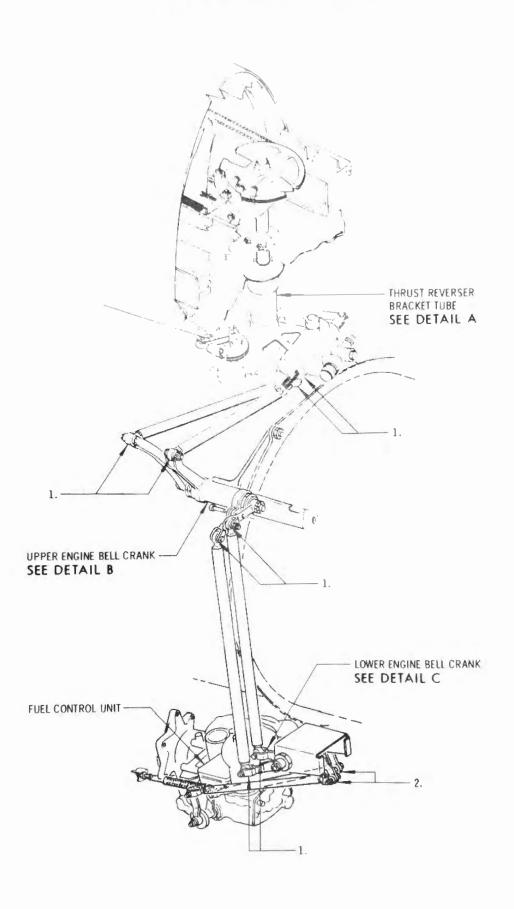
Two parts Dow Corning 550 to one part solvent.

Two parts Dow Corning 510-100 Centistoke to one part of solvent.

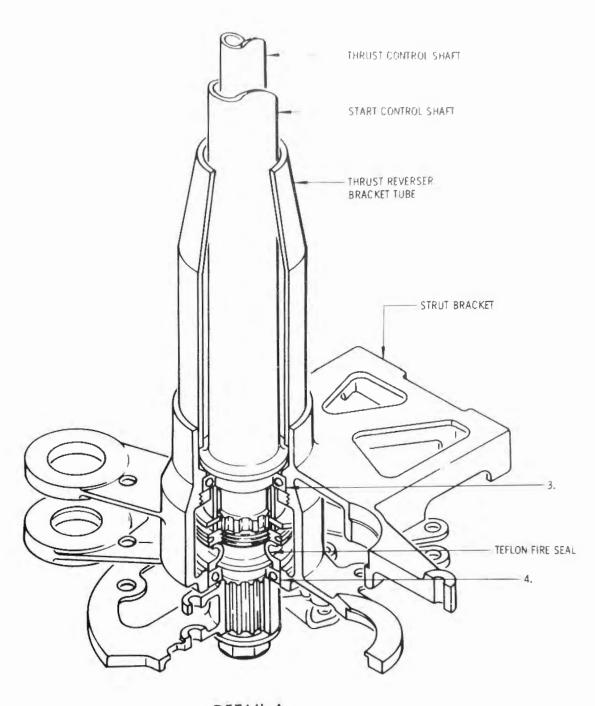
One part Dow Corning 510-500 Centistoke to one part of solvent.

One part Dow Corning 510-1000 Centistoke to two parts of solvent.



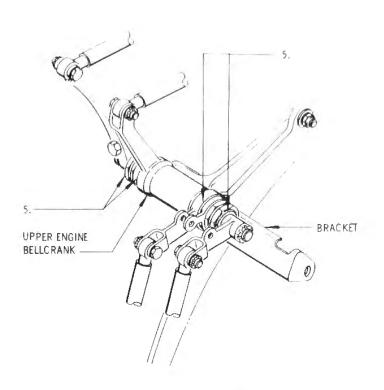






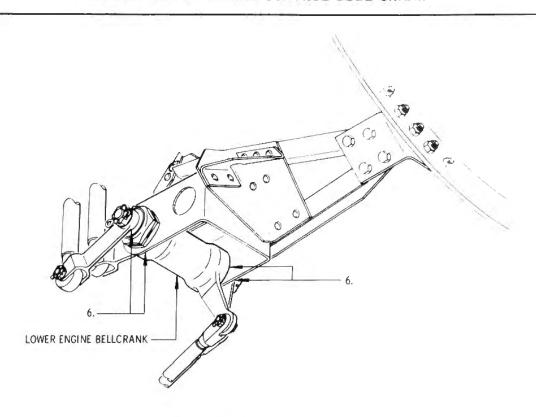
DETAIL A





DETAIL B

TYPICAL UPPER ENGINE CONTROL BELL CRANK



DETAIL C
TYPICAL LOWER ENGINE CONTROL BELL CRANK





2. Adjustment/Test Throttle System

A. General

- (1) When performing adjustment/test, the throttle system for each engine is divided into two parts: the thrust system and the engine start control system. Each part is adjusted separately. Rigging pins are inserted at various points to isolate sections of each system to facilitate rigging. Cables in each section must be rigged to an equal load so that proper adjustment will be maintained after rigging pin removal.
- (2) The thrust system is adjusted to synchronize forward thrust lever and reverse thrust lever movements with engine thrust variation. The system is rigged from the control stand to the engine control drum-and-shaft assembly. Finally, the thrust system is rigged from the drum-and-shaft assembly to the fuel control unit on the engine. (See figure 201A.)
- (3) The engine start control system is adjusted to synchronize engine start lever movement with ignition and fuel flow initiation. The system is rigged from the control stand to the engine control drumand-shaft assembly. (See figure 201A.) Next, the system is rigged from the drum-and-shaft assembly to the fuel control unit on the engine. On AA and TWA airplanes, the supplemental engine fuel shutoff valve is also rigged.
- (4) When new cables are installed the initial yield must be taken up before the control cables are rigged to normal operating tension. Rig new cables to 100 pounds and cycle the system 25 times without lockwiring cable turnbuckles. After cycling reduce cable tension to the appropriate tension for ambient temperature per table on figure 201A, and lockwire turnbuckles.

CAUTION: DO NOT ATTEMPT TO OPERATE CONTROLS WITH RIGGING PINS INSTALLED.

B. Equipment and Materials

(1) Bubble Protractor - F52485-500 or equivalent

Throttle System Adjustment Figure 201A

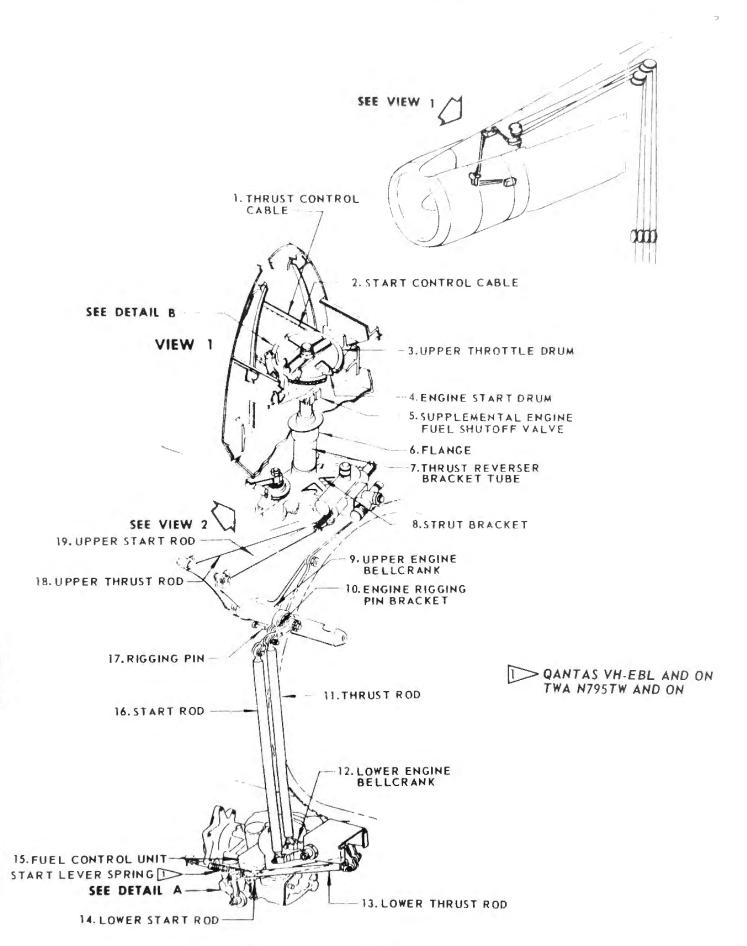


MAINTENANCE MANUAL

- TURBOF AN
 - Reverse Thrust Lever Protractor Assembly F70044 or equivalent
 - Lock Assembly, Leading Edge Flap F70064-503 or equivalent (3)
 - (4) Fuel Regulator Control Gage Assembly - F70127 or equivalent
 - (5) Rigging Pins, MS20392 - 4 or AN5 bolts
 - (6) Throttle Rigging Lock Assembly - F70084-1 or equivalent
 - (7)Tensiometer - 0 to 100 pound capacity
 - (8)Spring scale
 - (9) Air pressure source that can be regulated from 0 to 50 psi gage pressure
- (10)Deleted
- (11)Spacer - 0.41 inches
- C. Adjust throttle System
 - (1) Adjust Thrust System
 - (a) Remove engine left cowl panel.
 - (b) Insert rigging pin (23, figure 203) through bracket and thrust reverser main valve actuating cam (22) on engine control drum and shaft assembly.
 - (c) Position and lock thrust lever in idle no load position.
 - 1) Deleted
 - 2) Deleted
 - Clamp thrust lever against idle stop on control stand. 3)
 - Position reverse thrust lever to "OFF" position.
 - Lower wing leading edge flaps for turnbuckle access.
 - Pressurize utility hydraulic system. 1)
 - Position flap control lever to "DOWN." 2)
 - Install leading edge flap down locks. 3)

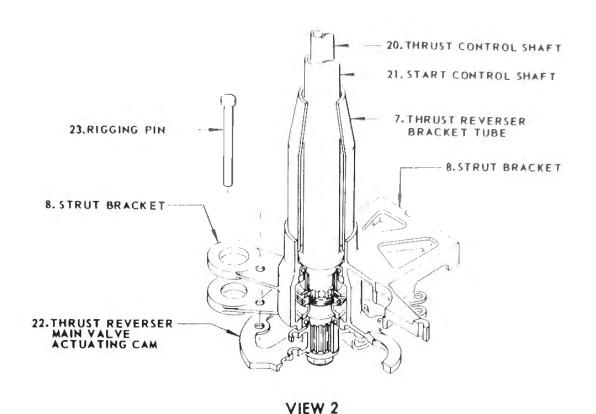


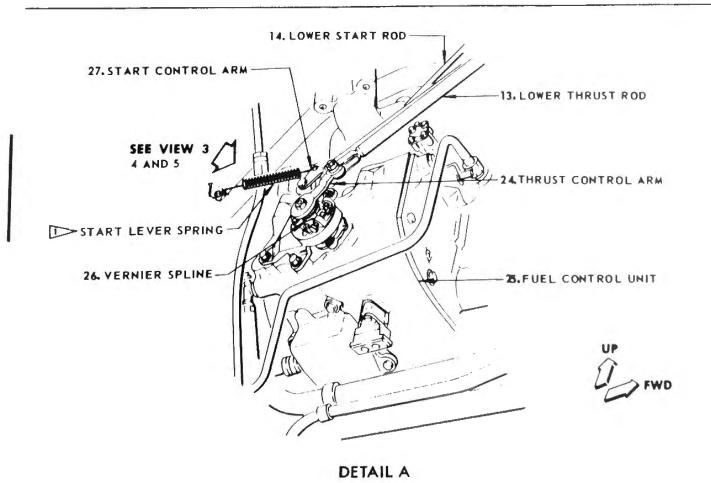






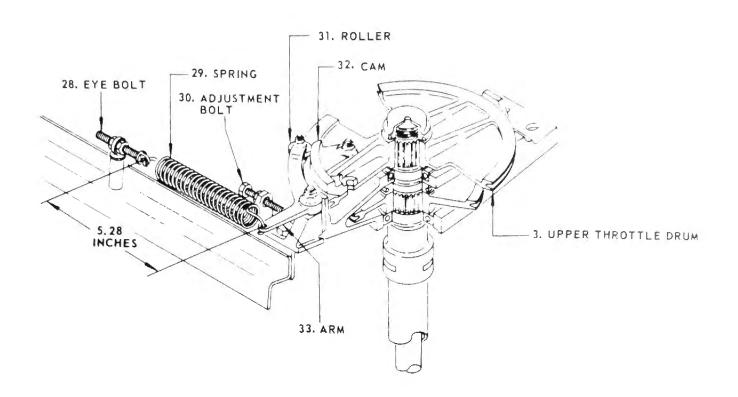




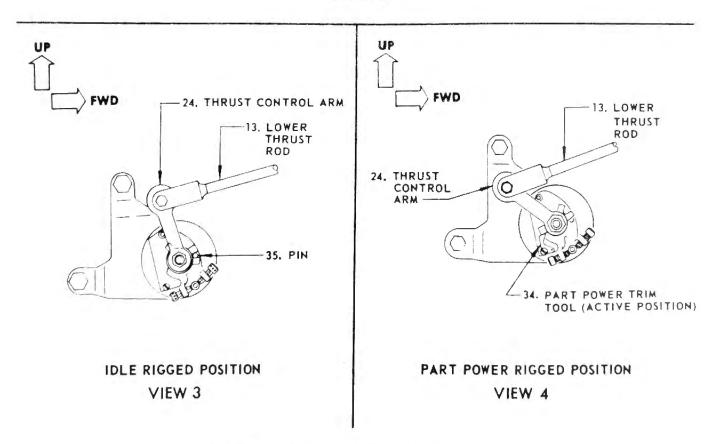








TORQUE COMPENSATOR CAM ASSEMBLY DETAIL B







(e) Adjust turnbuckles in wing leading edge to rig cables to load specified in figure 201A. Use tenslometer to measure rigging load and balance tension so rigging pin (23, figure 203) fits freely.

NOTE: If turnbuckle travel is not adequate for complete adjustment of cable tension, further adjustment is possible by use of turnbuckle in lower nose compartment and forward cargo compartment. Access in cargo compartment is provided by removal of ceiling. See Chapter 25, "Forward Cargo Compartment."

- (f) Remove leading edge flap down locks.
- (g) Raise wing flaps.
- (h) Depressurize utility hydraulic system.
- (i) Release adjustable control rod (18) from actuating cam (22).
- (j) Insert rigging pin (17) through rigging pin bracket (10) and throttle control arm on engine control drum and shaft assembly.
- (k) Adjust upper thrust rod (18) so that rod may be attached with rigging pin installed and attach upper rod (18).
- (1) Release lower thrust rod (13) from thrust control arm (24).
- (m) Rotate thrust control arm (24) counterclockwise against full power stop. Hold until completion of step (n).
- (n) Use vernier spline (26) to adjust thrust control arm (24) until it is pointing aft and parallel to the horizontal center line of the engine within \pm 1/2 degree.
- (o) Rotate the thrust control arm (24) clockwise approximately 75 degrees and insert 0.093 (± 0.005) inch pin (35) thru stop in stop fitting into hole in fuel control unit marked "I."
- (p) Adjust length of lower thrust rod (13) so that it will attach freely to thrust control arm (24) and attach.
- (q) Remove all rigging pins and throttle clamps from system.
- (r) Install part power trim tool (34) to active position on fuel control unit.





- (s) Slowly advance each throttle until part power trim stop is contacted and gradually release lever.
- (t) Check that each throttle lever is aligned with all other levers within 0.25 inches, measured at 12.00 inch radius from lever pivot. (Knob center lines are at 12.25 inches.)
- (u) If levers are not aligned correctly readjust by adjusting length of upper thrust rod (18). Adjust to a mean lever position of 0.25 inches relative to other levers, not one extreme or the other. The lower thrust rod (13) may be used for increased adjustment range if threads in upper rod are inadequate.

NOTE: If levers are adjusted per step (u) pins (17) and (35) may not fit when levers are in idle position.

- (v) Replace part power trim tool (34) to inactive position.
- (w) Adjust torque compensator assembly.
 - 1) Install rigging pin (23) through start bracket (8) and thrust reverser main valve actuating cam (22).
 - 2) Adjust eyebolt (28) so spring (29) has a 5.28 (± 0.06) inch length. Roller (31) will be in contact with cam (32). Tighten checknuts.
 - 3) Set adjustment bolt (30) so roller (31) is 0.010 (+0.00/-0.008) inches from cam (32). Tighten checknuts.
 - 4) Remove rigging pin (23) from thrust reverser main valve actuating cam.





- (x) Check adjustment of landing gear warning switches. Refer to Chapter 32, "Landing Gear Warning System."
- (y) Check adjustment of flap, speed brake and stabilizer trim warning switch for engine No. 3. Refer to Chapter 27, "Wing Flap Warning Circuit Components."
- (2) Adjust Engine Start Control System
 - (a) Position engine start lever.
 - 1) Place 0.41 inch spacer against "CUTOFF" detent stop on control stand.
 - 2) Position engine start levers against spacer so that start lever detent lugs contact spacer. Clamp levers against spacer.
 - (b) Remove engine cowl panels.
 - (c) Lower wing leading edge flaps for turnbuckle access.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."





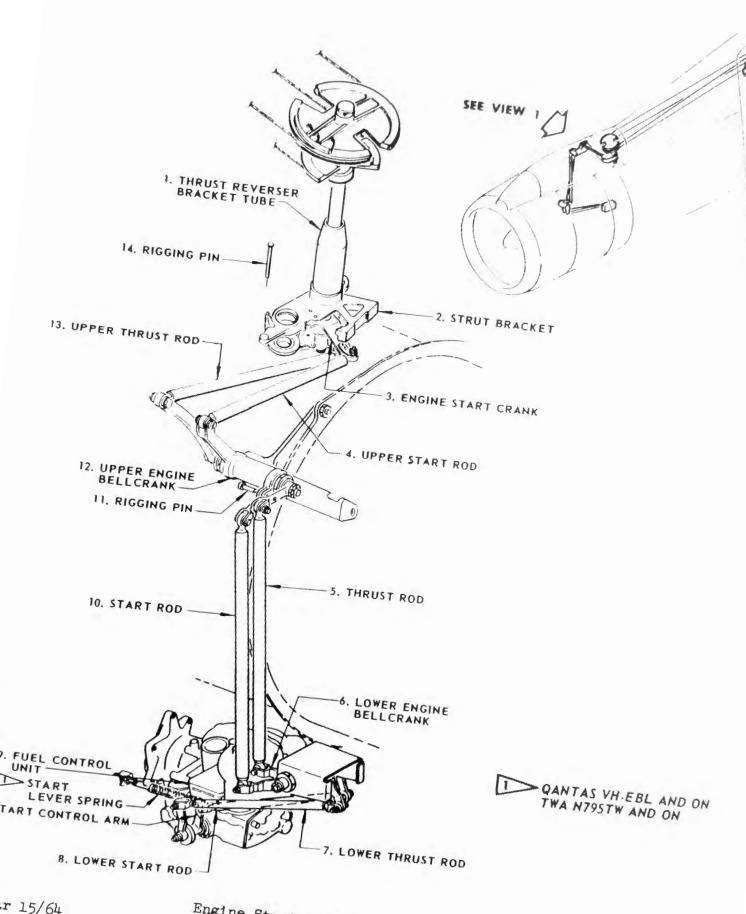
- 3) Install leading edge flap lock assembly.
- (d) Adjust turnbuckles in wing leading edge until rigging pin (14, figure 204) can be inserted freely through engine start crank (3) and strut bracket (2) when cables are rigged to tension specified in figure 201A. Measure cable load with tensiometer.

NOTE: If turnbuckle travel is not adequate for complete adjustment of cable tension, further adjustment is possible by use of turnbuckles in lower nose compartment and forward cargo compartment. Access in cargo compartment is provided by removal of ceiling. (See Chapter 25, 'Forward Cargo Compartment."

- (e) Adjust length of upper start rod (4) so that rigging pin (11) can be freely inserted through upper engine bellcrank (12) and rigging pin bracket and install rigging pin.
- (f) Release lower start rod from start control arm.
- (g) Position start control arm at 37° index mark on fuel control unit.
- (h) Adjust length of (80° from horizontal) lower start rod (8) so that rod may be attached with rigging pin inserted in crank.
- (i) Connect lower start rod (8) to start control arm.

EFFECTIVITY TURBOFAN

Stratoliner MAINTENANCE MANUAL



Engine Start System Adjustment Figure 204





- (j) Remove rigging pins.
- (k) Install cowl panels and access panels.
- (1) Remove clamps from engine start lever.
- (m) Remove spacer from behind lever.
- (n) Remove leading edge flap lock assembly.
- (o) Check adjustment of ignition switch. See Chapter 74, "Ignition Switches."
- D. Test Throttle System
 - (1) Remove engine cowl panels.
 - (2) Test engine start system.
 - (a) Insert rigging pin through start crank and strut bracket.
 - (b) Check that start lever has $4-1/4^{\circ}$ (± 2°) overtravel to "CUT-OFF."
 - (c) Check that indicator on fuel control unit is at 37° (± 1°) scribe mark.
 - (d) Remove rigging pins.
 - (e) Advance start lever to "START" position.
 - (f) Check that start lever on fuel control unit has traveled at least 44 degrees from position at "CUT-OFF."





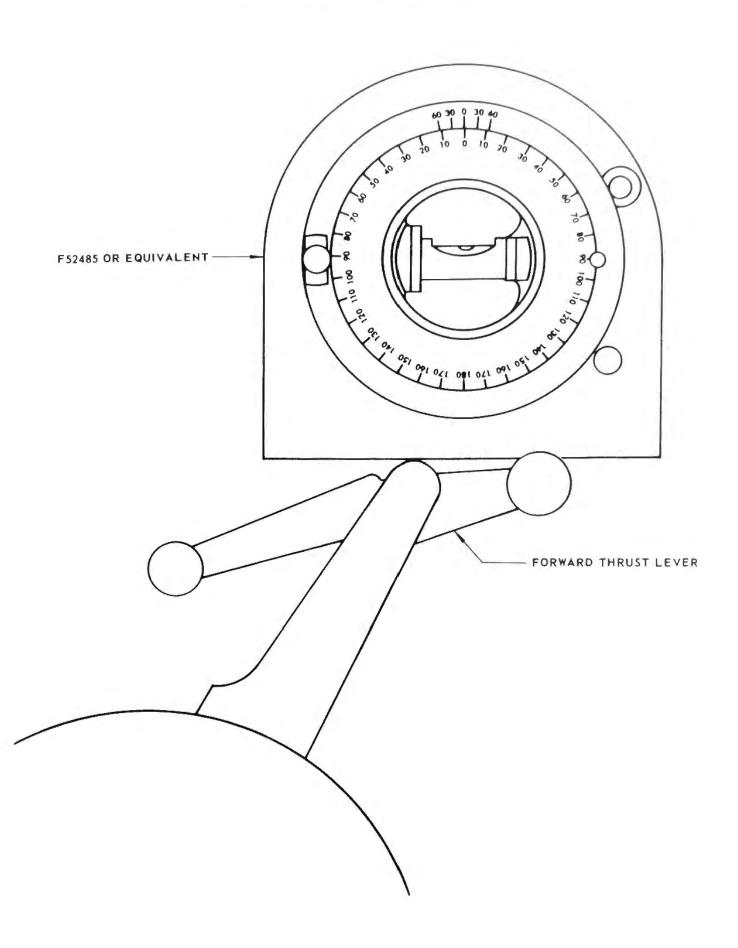
- (g) Advance start lever to "IDLE" position.
- (h) Check that load on lever as measured at knob center line does not exceed 7.5 pounds through full range of travel.
- (i) Check that start lever on fuel control unit has traveled at least 53 degrees from "CUT-OFF" position.
- (3) Test Thrust System
 - (a) Apply 25 psig pressure at the Pt4 ground service connection.

CAUTION: CHECK THAT BOTH ENGINE AND FAN COWL PANELS ARE COMPLETELY REMOVED BEFORE CONNECTING AIR SUPPLY.

- (b) Set friction regulator brake handle at full aft position.
- (c) Using spring scale at knob center line, advance forward thrust lever through entire travel.
- (d) Check that load on lever does not exceed 3.5 pounds.
- (e) Return thrust lever to idle position.
- (f) Set brake handle at fully forward position (full brake).
- (g) Advance thrust lever through entire range of travel.
- (h) Check that load on lever is 2 to 4 pounds greater than load observed in step (d).
- (i) Check that friction regulator brake handle retains setting during lever travel.
- (j) Return friction regulator brake handle to full aft position.
- (k) Place the forward thrust lever against the control stand idle stop.
- (1) Check rigging pin (23, figure 203) fits freely through bracket and thrust reverser main valve actuating cam (22) on engine control drum and shaft assembly. Use MS20392-4 or AN5 bolt for rigging pin.











- (m) Remove part power trim tool from stowed position and install in active position.
- (n) Advance forward thrust lever until lever on fuel control unit contacts stop.
- (o) Check that forward thrust lever has traveled 36° (± 3°) from idle position. Use bubble protractor to measure position. (See figure 206.)
- (p) Slowly release each lever and allow to spring back. Check that each lever is aligned within 1/4 inch of adjacent levers.
- (q) Return thrust lever to idle position.
- (r) Return part power trim tool to stowed position.
- (s) Advance forward thrust lever until the 100% forward thrust stop at the thrust reverser main valve actuating cam in the strut or at the engine fuel control unit is contacted.
- (t) Gradually release lever allowing it to spring back.
- (u) Check that final forward thrust lever position is at least 58 degrees from idle position.
- (v) Check that thrust control arm on fuel control unit is at least 71.2 degrees counterclockwise from idle position.
- (w) Advance forward thrust lever until the control stand full forward thrust stop is contacted.
- (x) Check that forward thrust lever has traveled at least 66-1/2 degrees from idle position.
- (y) Move forward thrust lever to idle position.
- (z) Position reverse thrust lever not less than 20° from off position.
- (aa) Apply 20 pound load in forward direction to forward thrust lever.
- (ab) Check that locking device resists load.
- (ac) Return forward thrust lever to idle position.
- (ad) Move reverse thrust lever to full aft position.
- (ae) Turn air supply off.





- (af) Move reverse thrust lever to "OFF" position.
- (ag) Advance forward thrust lever against stop position and apply 50 pound load to lever in forward direction. Follow up lock shall withstand load.
- (ah) Perform the following additional check on airplanes equipped with interlock override provisions. (TWA N795TW and on and QANTAS VH-EBL and on.)
- (ai) Move forward thrust lever to idle position.
- (aj) With air pressure remaining off, manually push aft sleeve only to cruise (forward) position.
- (ak) Actuate the forward thrust lever forward against the first stop, approximately 12° from idle position. The follow-up lock shall withstand a 15 pound load in the forward direction.
- (al) Apply a 25 pound load to the lever in the forward direction. The lever shall rotate a minimum of 45° from the idle position before the second stop is contacted.
- (4) Test Reverse Thrust System
 - (a) Restore 25 psig to Pt4 and note clamshell doors return to forward thrust position and "Reverser Operating Light" goes off.
 - (b) Position forward thrust lever 5° (± 2°) from idle position.
 - (c) Pull reverse thrust lever aft until motion is locked by pawl.
 - (d) Check that lever is not more than 15 degrees from idle position. Measure angle with reverse thrust lever protractor assembly.
 - (e) Using spring scale apply 10 pound load in aft direction. To each reverse thrust lever, pawl shall resist load.
 - (f) Return forward thrust lever to idle position.
 - (g) Move reverse thrust lever to 'OFF" position then using spring scale move lever aft through full range of travel.
 - (h) Check that load required to pull lever from 'OFF" detent is 1.5 (+1.5/-1.0) pounds.
 - (i) Check that load does not exceed 6.0 pounds at any point during first 65° of travel, 5.0 pounds during remainder of travel.





- (j) Position the reverse thrust lever so the 100% reverse thrust stop at the thrust reverser main valve actuating cam in the strut or at the engine fuel control unit contacts.
- (k) Check that thrust control lever on fuel control unit is at least 52° clockwise from idle position or that the full power stop on the fuel control unit is contacted.
- (1) Gradually release lever and allow it to spring back.
- (m) Check that final lever position is at least 112° from "OFF" position.
- (n) Return reverse thrust levers to "OFF" position.
- (o) Disconnect air supply.
- (p) With forward thrust lever in idle position actuate the reverse thrust lever aft against a stop.
- (q) Apply a 50 pound load to lever in aft direction.
- (r) Follow up lock should withstand load.
- (5) Test Friction Brake Regulator
 - (a) Rotate friction brake regulator lever through full travel.
 - (b) Check that lever moves freely through full travel.
 - (c) Check that force required to disengage lever handle from ratchet is 5 to 10 pounds.
 - (d) Check that friction brake regulator lever retains setting during full travel of forward thrust levers.
- (6) Replace cowl panels.

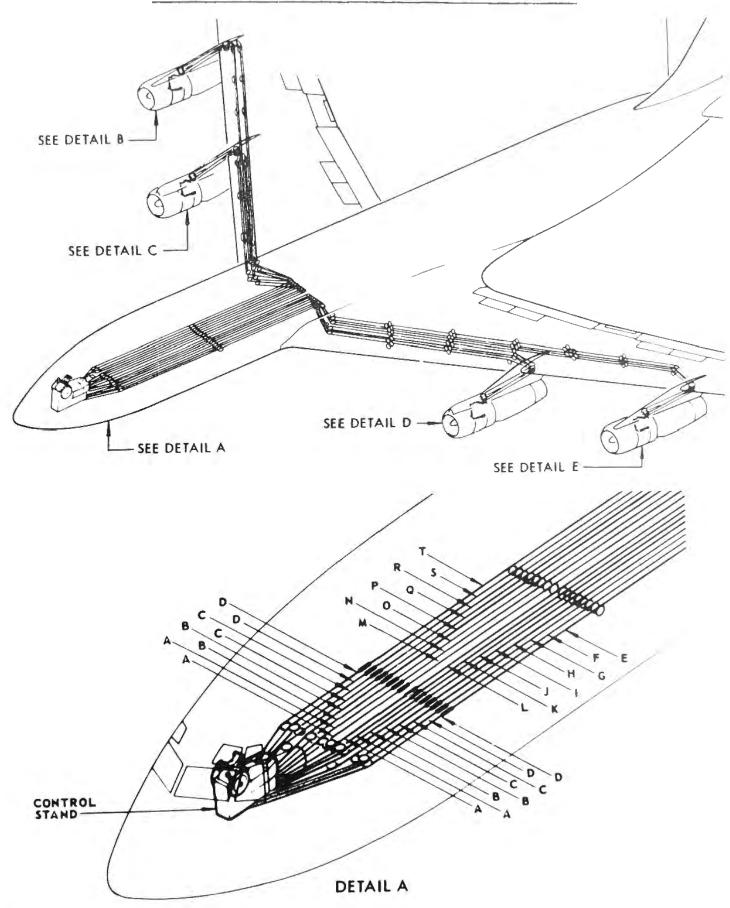
3. Inspection/Check Throttle System

- A. Examine throttle control cables for wear.
 - (1) Engine thrust cables are allowed 65% wear of outer wires before replacement.
 - (2) Engine start cables are allowed 65% wear of outer wires before replacement.



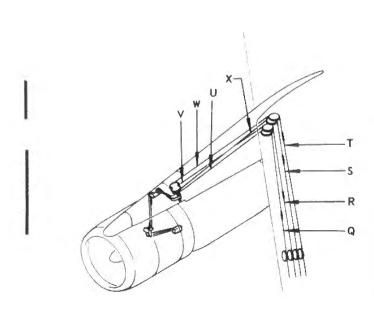


THROTTLE CONTROL CABLES - MAINTENANCE PRACTICES

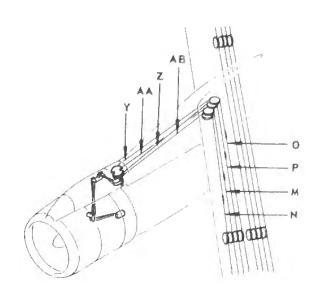




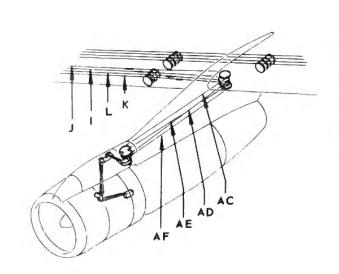




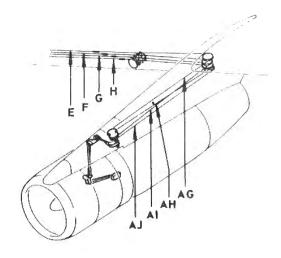
DETAIL B



DETAIL C



DETAIL D



DETAIL E

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MAINTENANCE MANUAL

CABLE REF.	DRAWING NO.	NO. REG.	LENGTH			CABLE	FITTINGS			
			A	В	С	SIZE	1.	2.	3.	4.
A	66-3155-20	2	501.2	260.5	96.0	3/327×7	AN669S3LH	BAC-T14B-3	BAC-T14B-3	AN66953LI
В	66-3155-18	2	497.5	257.6	82.6	3, 32 7 x 7	AN66953LH	BAC-T14B-3	BAC-T14B-3	AN66953LH
c	66-3155-19	2	341.3	180.6	13.2	3/32 7 x 7	AN669S3LH	BAC-T14B-3	BAC-T14B-3	AN669S3LH
D	66-3155-17	2	401.9	200.8	23.9	3/32 7 x 7	AN66953RH	BAC-T14B-3	BAC-T148-3	AN66953LH
E	NAS-303-47-7765	1	776.63			3/32 7 x 7	MS21260S3LH	MS21260L3RH		
F	NAS-303-46-7544	1	754.5	3		3/327×7	M52126053RH	MS21260L3RH		
G	NAS-303-46-8492	1	849.25			3.732 7 x 7	MS2126053RH	MS21260L3RH		
H	NAS-303-46-8551	1	855.13			3. 32 7 x 7	MS21260S3RH	MS21260L3RH		
. 1	NAS-303-46-4476	1	447.75			3/32 7 x 7	MS21260S3RH	M521260L3RH		
J	NAS-303-46-4496	1	449.75			3/32 7 x 7	MS21260S3RH	MS21260L3RH		
K	NAS-303-46-5090	1	509.0			3/32 7 x 7	MS2126053RH	MS21260L3RH		
L	NAS-303-46-5102	1	510.25			3/32 7 1/4 7	MS21260S3RH	MS21260L3RH		
м	NAS-303-56-5102	1	510.25			3/32 7 x 7	MS21260S3RH	MS21260L3LH		
N	NAS-303-56-5090	1	509.0			3/327×7	MS21260S3RH	MS21260L3LH		
0	NAS-303-56-4496	1	449.75			3/32 7 x 7	MS2126053RH	MS21260L3LH		
P	NAS-303-56-4476	1	447.75			3/327 x 7	MS21260S3RH	MS21260L3LH		
Q	NAS-303-56-8551	1	855.13			3/32 7 × 7	M52126053RH	MS21260L3LH		
R	NAS-3 03-56-8492	1	849.25			3/32 7 × 7	M\$21260S3RH	MS21260L3LH		
s	NAS-3 03-56-7544	1	754.5			3/327×7	MS2126053RH	MS21260L3LH		
т	NAS-303-57-7765	1	776.63			3/327×7	MS21260S3LH	MS21260L3LH		
U	BAC-C13G-320-1288	1	128.8			3 32 7 x 7	AN669L3RH	BAC-T14A-3		
VD	BAC-C13G-320-1600	1	160.0			3. 32 7 × 7	AN669L3RH	BAC-T14A-3		
VD	BAC-C13G-320-1605	1	160.5			3 · 32 7 × 7	AN669L3RH	BAC-T14A-3		
W	BAC-C13G-320-2100	1	210.0			3/32 7 × 7	AN669L3RH	BAC-T14A-3	VI.	

QANTAS VH-EBA THRU VH-EBK

> QANTAS VH.EBL AND ON

V

CABLE REF.	DRAWING NO.	NO.	LENGTH		CABLE	FITTINGS				
		REQ.	A	В	С	SIZE	1.	2.	3.	4.
X	BAC-C13G-320-2200	1	220.0			3/32 7 × 7	AN669L3RH	BAC-T14A-3		
Y	BAC-C13G-320-2340	1	234.0			3/32 7 × 7	AN669L3RH	BAC-T14A-3		
Z	BAC-C13G-320-2025	1	202.5	1.		3/32 7 × 7	AN669L3RH	BAC-T14A-3		
AA	BAC-C13G-320-1558	1	155.8	8		3.327 x 7	AN669L3RH	BAC-T14A-3		
AB	BAC-C13G-320-1235	1	123.5			3/32 7 x 7	AN669L3RH	BAC-T14A-3		
AC	BAC-C13G-319-2244	1	224.4			3 32 7 × 7	AN669L3LH	BAC-T14A-3		
AD	BAC-C13G-319-2115	1	211.5			3. 32 7 × 7	AN669L3LH	BAC-T14A-3		
AE	BAC-C13G-319-1460	1	146.0	4		3 '32 7 × 7	AN669L3LH	BAC-T14A-3		
AF	BAC-C13G-319-1343	1	134.3			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
AG	BAC-C13G-319-1998	1	199.8			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
AH	BAC-C13G-319-1510	1	151.0			3 32 7 x 7	AN669L3LH	BAC-T14A-3		
Al	BAC-C13G-319-2300	1	230.0			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
AJ	BAC-C13G-319-1390	1	139.0			3/32 7 x 7	AN669L3LH	BAC-T14A-3		
								1		
	14									
	1									
	71			1		1		1		

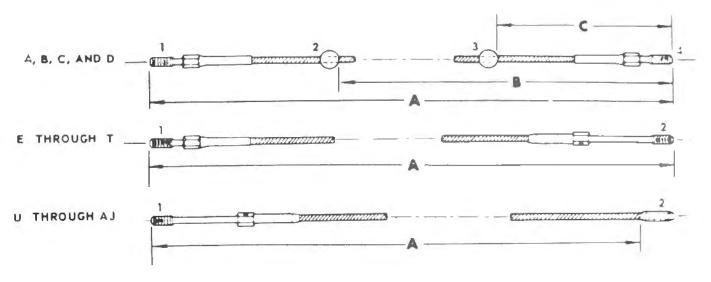
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Throttle Control Cables
Figure 201 (Sheet 5 of 5)





THRUST LEVER FRICTION BRAKE - MAINTENANCE PRACTICES

. Pemoval/Installation Thrust Lever Friction Brake Crank

- A. Equipment and Materials
 - (1) Tensicmeter 0 to 100 pounds capacity
 - (2) Dowel 1-1/2 inches diameter, 10 inches long
 - (3) Rigging pins are MS-20392-4 or AN5 bolts
- B. Remove Thrust Lever Friction Brake Crank
 - (1) Depressurize hydraulic systems.
 - (a) Connect electrical power.
 - (b) Manually position the utility system bypass valve to "RYPASS."
 - (c) Connect the utility and auxiliary hydraulic systems by operating the interconnect switch on the copilot's instrument panel.
 - (2) Open main gear wheel well doors and right engine cowl panel.
 - (3) Remove nacelle strut access panels No. 3716 (for turbocompressor equipped engines) and access panels No. 1739 (for other engines). See Chapter 12, "Access Doors and Panels."
 - (4) Insert rigging pin through strut bracket and thrust reverser main valve actuating cam on engine control drum and shaft assembly.
 - (5) Insert rigging pin in center speed brake control drum and drum support in right wheel well. (See figure 209.)
 - (6) Install rigging pin through flap control valve support bracket and follow-up cable drum in each main gear wheel well. (See figure 211.)
 - (7) Insert rigging pin through engine start arm and bracket. (See figure 210.)



- (8) Relieve tension on stabilizer trim chain assembly by adjusting support linkages to raise forward mechanism. (See figure 205.)
- (9) Relieve tension on wing flap control cables by loosening turnbuckles in lower nose compartment.
- (10) Relieve tension on speed brake control cables by loosening turnbuckles in lower nose compartment.
- (11) Relieve tension on thrust cables for engines No. 1 and No. 2. Disconnect thrust cables for engines No. 3 and No. 4.
- (12) Relieve tension on all engine start cables.
- (13) Remove left tie rod nut (15, figure 204.)
- (14) Pull stabilizer trim control wheel tie rod (6) from stabilizer trim control wheel shaft (1).
- (15) Remove right stabilizer trim control wheel (5) from stabilizer trim control wheel shaft.
- (16) Remove upper right access cover (4).
- (17) Remove forward right electronic unit (13) from aft electronic panel.
- (18) Remove lower right access panel (7) to gain access to the mounting nuts on upper right side panel (9).
- (19) Remove switch guard (8) to gain access to bolt (14) for removal of upper right side panel.
- (20) Loosen stabilizer trim indicator crank bolt from nutplate (11) on upper right side panel.
 - NOTE: Do not remove bolt from stabilizer trim indicator crank.
- (21) Remove bolt (14) from within aft electronic panel and upper right side panel. Nut will be free to fall when bolt (14) is removed.
- (22) Remove right control shaft nut (3).
- (23) Remove bottom screws in upper right side panel (9) and remove splice channel (10). Two nuts will be free to fall when bottom screws are removed.

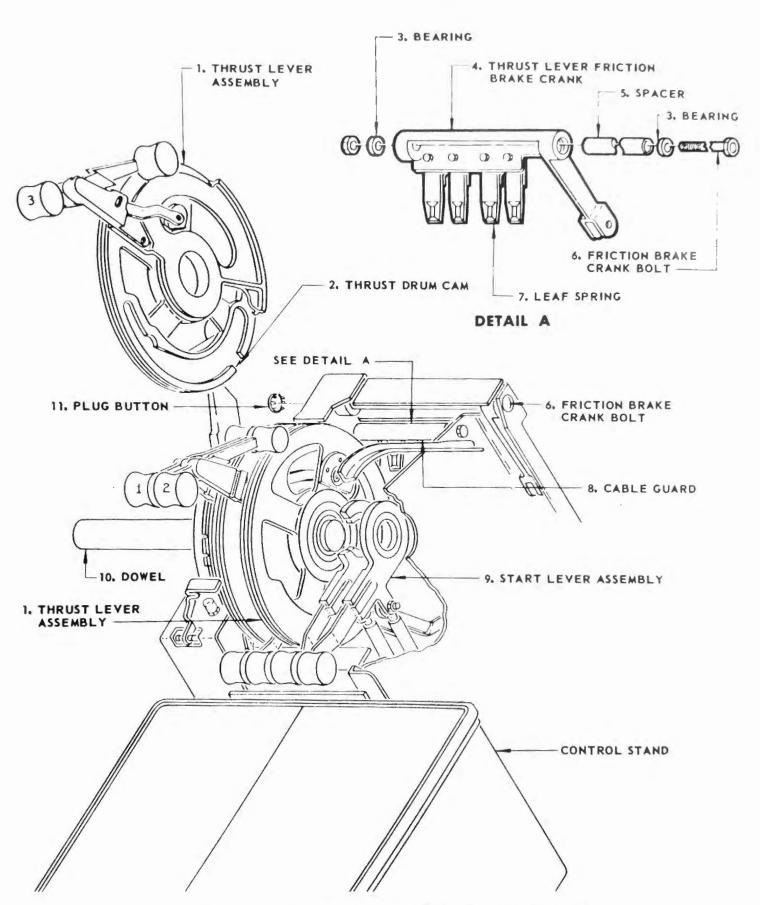


- (24) Remove key (2) from slot in upper right side panel (9) and right control shaft (12), as upper right side panel is moved to right.
- (25) Remove upper right side panel (9).
- (26) Replace right control shaft nut (7, figure 203) on right control shaft (1) to allow removal of spacer, stabilizer trim indicator, friction brake handle and flap handle as a unit.
- (27) Detach eye bolt (4) from friction brake crank (2) by removing bolt (3).
- (28) Detach stabilizer trim indicator link (10) from stabilizer trim indicator crank (8) by removing flat head pin (9).
- (29) Remove right control shaft (1) with nut, spacer, trim indicator, friction brake handle and flap handle as a unit.
- (30) Rotate left stabilizer trim wheel until the connector link (6) in the stabilizer trim chain is in an accessible position for removal.
- (31) Detach connector link and remove chain from sprocket. Secure chain in bottom of control stand.
- (32) Remove start lever detents (11, figure 202) from cover assemblies (2).
- (33) Remove forward and aft cover tie straps (1 and 13).
- (34) Remove forward and aft cover angles (3 and 8).
- (35) Disconnect mach trim warning light cover (11, figure 203).
- (36) Lift cover assemblies (2, figure 202) from control stand.
- (37) Remove switch actuator arm (4).
- (38) Remove left stabilizer trim control wheel (12) from stabilizer trim control wheel shaft (5).
- (39) Remove stabilizer trim control wheel shaft (5) and sprocket (6) from right side of control stand.
- (40) Remove left control shaft nut (10) from left control shaft.



- (41) Using dowel (10, figure 201), push left control shaft clear of control stand.
 - NOTE: Key (9, figure 202) will be free from left control shaft and upper left side panel when left control shaft is driven from control stand.
- (42) Pull dowel to left until No. 3 and 4 thrust lever assemblies can be lifted out of quadrant.
 - NOTE: Tag position of all spacers as they are removed. Position and thickness of spacers may vary in different control stands.
- (43) Pull start levers aft to obtain room for removal of friction brake crank from control stand.
- (44) Remove cable guard (8, figure 201) by removing bolt.
- (45) Remove plug button (11) from upper left side panel.
- (46) Remove bolt (6) and lift friction brake crank (4) from control stand.
 - NOTE: Bearings (3) and spacer (5) will be free in brake crank when bolt (6) is removed.
- C. Install Thrust Lever Friction Brake Crank
 - (1) Install spacer (5, figure 201) and bearings (3) in friction brake crank (4).
 - (2) Place friction brake crank (4) in control stand and secure by installing brake crank bolt (6).
 - (3) Install plug button (11) in upper left side panel.
 - (4) Install cable guard (8) in control stand.
 - (5) Install Nos. 3 and 4 thrust lever and Nos. 3 and 4 start lever in control stand.
 - (a) Position levers from right to left in following order: No. 4 start, No. 4 thrust, No. 3 start and No. 3 thrust.
 - (b) Position spacers in the order they were removed.
 - (c) Advance left control shaft from right to left as levers and spacers are positioned.





Installation of Thrust Lever Friction Brake Crank Figure 201

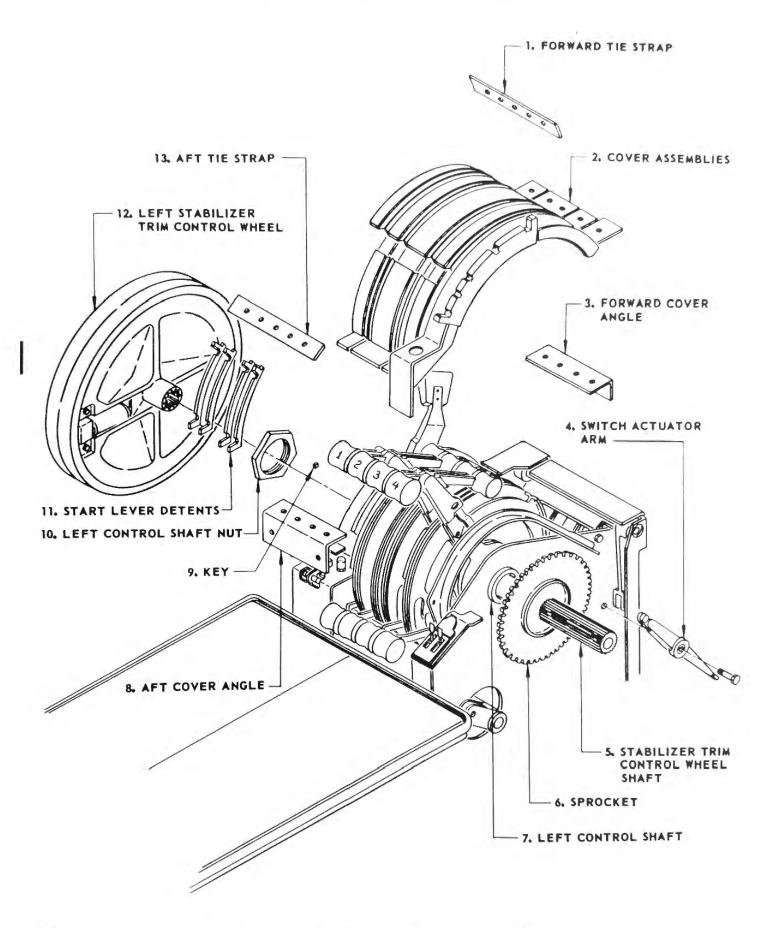


- (6) Complete installation of left control shaft.
 - (a) Push left control shaft against dowel (10).
 - (b) Force dowel to left until clear of control stand.

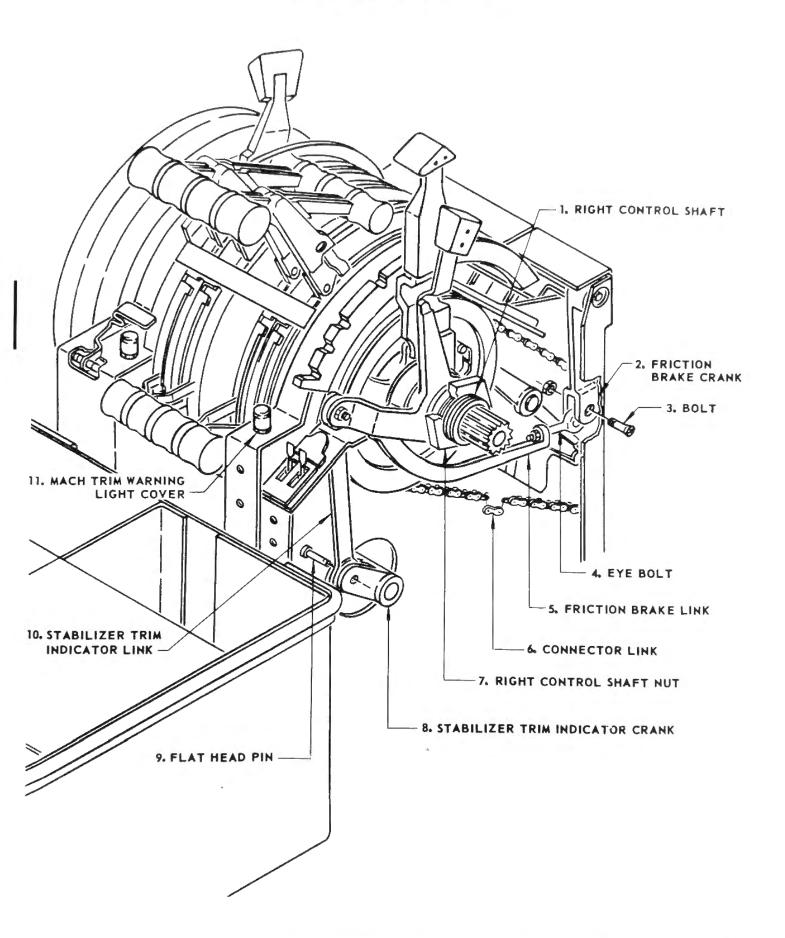
CAUTION: EXERCISE CARE TO PREVENT SPACERS FROM FALLING WHEN DOWEL IS FORCED FROM CONTROL STAND.

- (7) Insert key (9, figure 202) in left control shaft and upper left side panel.
- (8) Install left control shaft nut (10). Torque nut from 200 to 300 pound-inches.
- (9) Bend leaf springs (7, figure 201) so each contacts the brake drums with equal load.
- (10) Install stabilizer trim control wheel shaft (5, figure 202) and sprocket (6) in left control shaft (7).
- (11) Place stabilizer trim chain on sprocket and install connector link (6, figure 203).
- (12) Install flap position warning switch actuator arm (4, figure 202) on control stand inter-bulkhead.
- (13) Install cover assemblies (2) on control stand.
- (14) Install mach trim warning light cover (11, figure 203) on cover assembly (2, figure 202).
- (15) Install forward and aft cover angles (3) and (8) on control stand.
- (16) Install forward and aft cover tie straps (1) and (13).
- (17) Install start lever detents (11).
- (18) Install left stabilizer trim control wheel (12) on stabilizer trim control wheel shaft (5).
- (19) Install right control shaft (1) with nut, spacer, stabilizer trim indicator, friction brake handle and flap handle installed.
- (20) Connect eye bolt (4, figure 203) on friction brake link to friction brake crank (2) by installing bolt (3). Adjust eye bolt so, with friction brake handle in "OFF" position, brake shoes just contact brake drums.







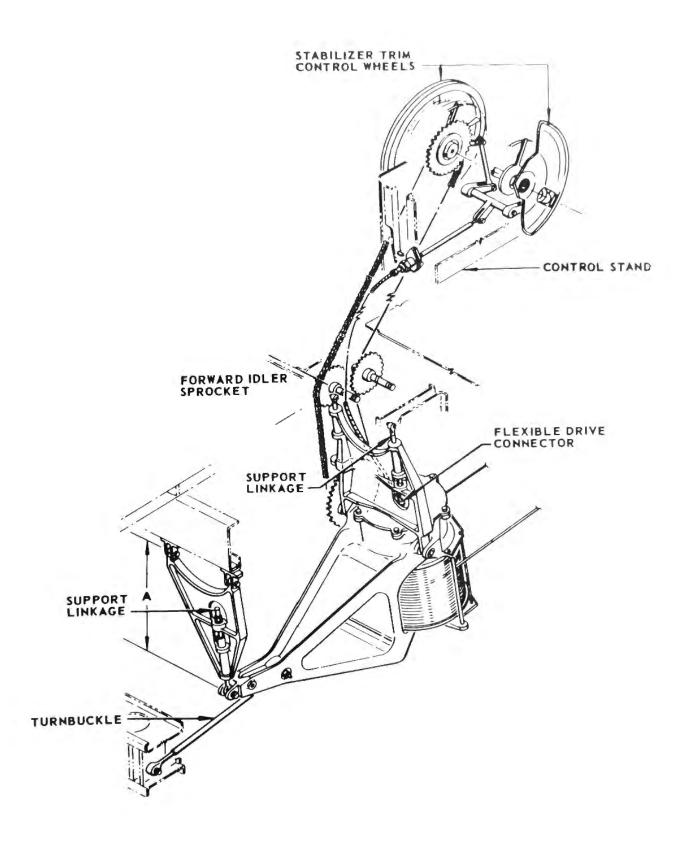




- (21) Connect stabilizer trim indicator link (10) to stabilizer trim indicator crank (8) by installing flat head pin (9).
- (22) Remove right control shaft nut (7) from right control shaft (1).
- (23) Attach upper right side panel (9, figure 204). Secure panel with screws on each side only.
- (24) Position splice channel (10) at bottom edge of upper right panel (9) and install bottom screws through upper right side panel and splice channel.
- (25) Install key (2) in upper right side panel (9) and right control shaft (12).
- (26) Install right control shaft nut (3). Torque nut from 200 to 300 pound-inches.
- (27) Install bolt (14) through aft electronic panel and upper right side panel.
- (28) Install switch guard (8).
- (29) Replace forward right electronic unit (13) in aft electronic panel.
- (30) Install right access cover (4) on control stand.
- (31) Install lower right access panel (7) on control stand.
- (32) Install right stabilizer trim control wheel (5) on stabilizer trim control wheel shaft (1).
 - NOTE: Handles on stabilizer trim control wheels should be 90 (± 5) degrees apart when installed on control stand.
- (33) Install stabilizer trim control wheel tie rod (6).
- (34) Install left stabilizer trim control wheel tie rod nut (15).
- (35) In lower nose compartment, tension trim chain assembly by adjusting support linkages to lower forward mechanism. (See figure 205.)
- (36) Check that stabilizer trim indicator position agrees with position of stabilizer. If out of adjustment see 27-10-0, "Adjustment/Test Stabilizer Trim System."

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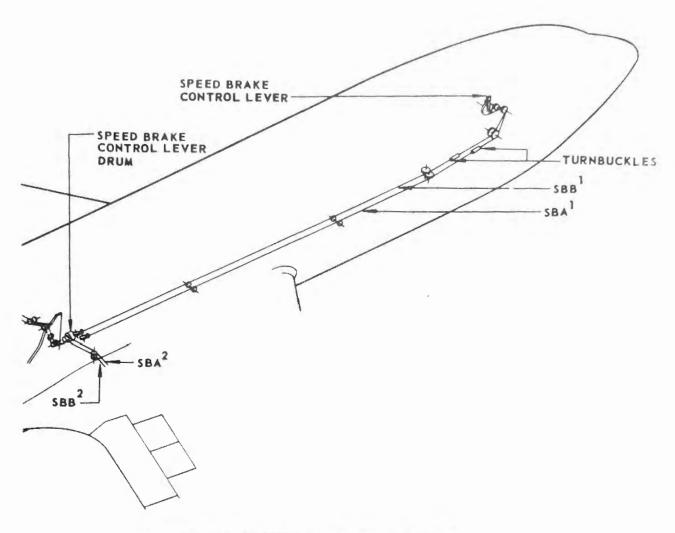






- (37) Tension speed brake control cables by adjusting turnbuckles in lower nose compartment. (See figure 206.)
- (38) Tension wing flap control cables by adjusting turnbuckles in lower nose compartment. (See figure 207.)
- (39) Connect thrust control cables for engines No. 3 and No. 4. Tension all thrust control cables by adjusting turnbuckles. (See figure 208.)
- (40) Tension all engine start cables by adjusting turnbuckles.
- (41) Remove rigging pin from center speed brake control drum and drum support in right wheel well. (See figure 209.)
- (42) Remove rigging pin from each thrust reverser main valve actuating cam and strut bracket and each engine start crank and bracket. (See figure 210.)
- (43) Remove rigging pins from each control valve support bracket and follow-up cable drum. (See figure 211.)
- (44) Replace nacelle strut access panels.
- (45) Close right engine cowl panel.

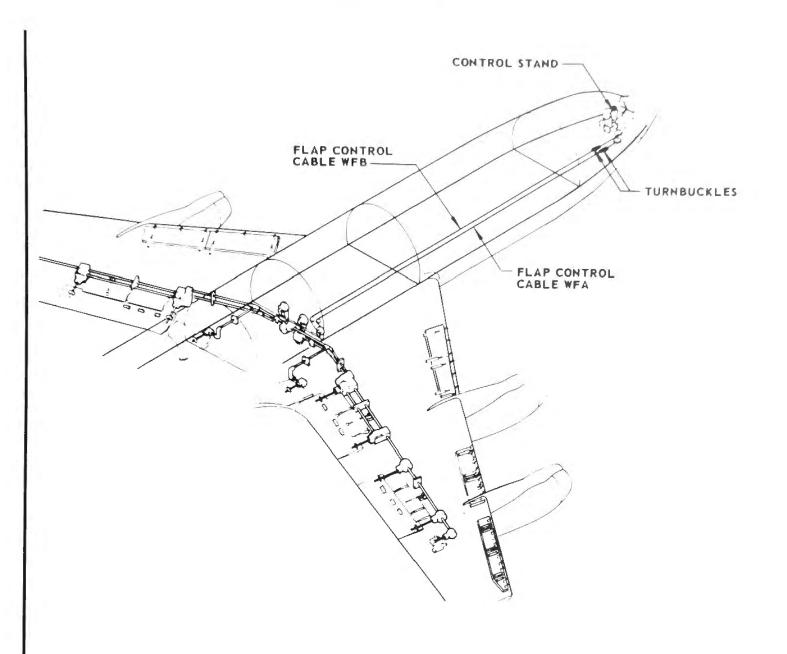




TEMP	RIGGING LOAD LB (± 10 LB)
110	119
90	111
70	100
70 50	92
30	84
10	75
-10	67
-30 -40	59
-40	53



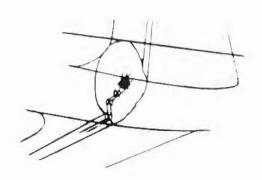


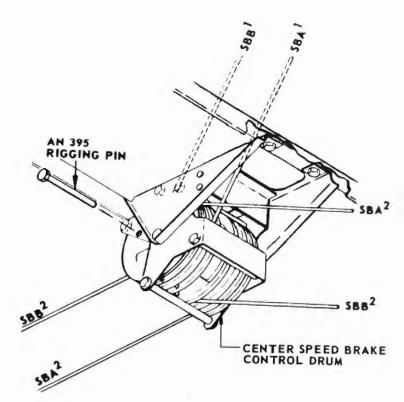


TEMP F	RIGGING LOAD ± 10 LBS WFA, WFB
100	73
90	61
70	50
50	40
30	32
+ 10	25
- 10	19
- 30	15
- 40	14

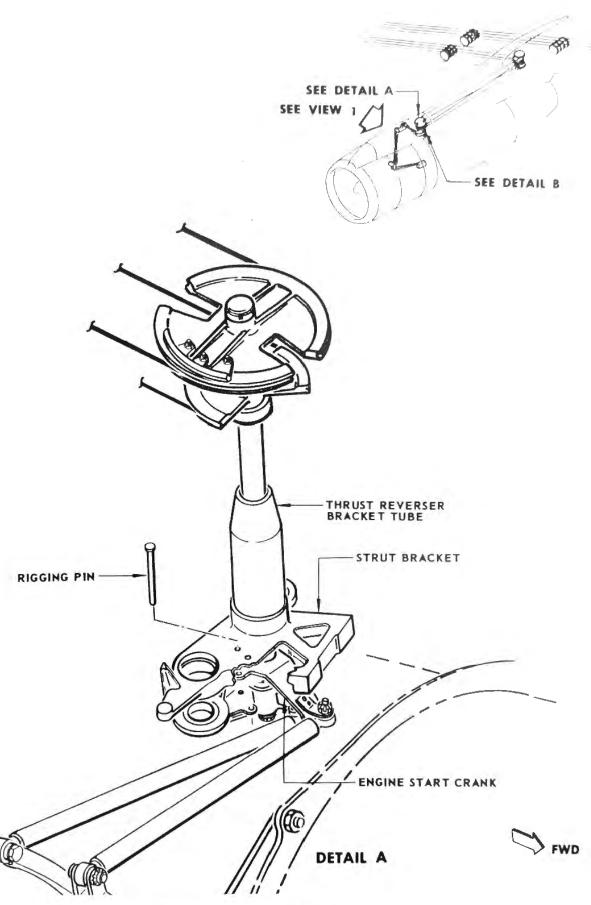
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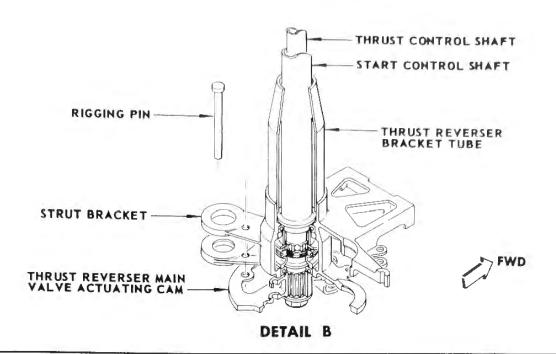
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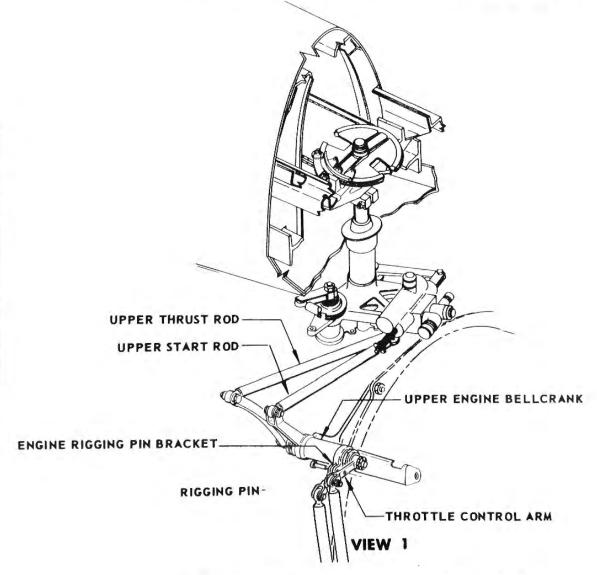


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Throttle System Rigging Pin Installation Figure 210 (Sheet 1 of 2)

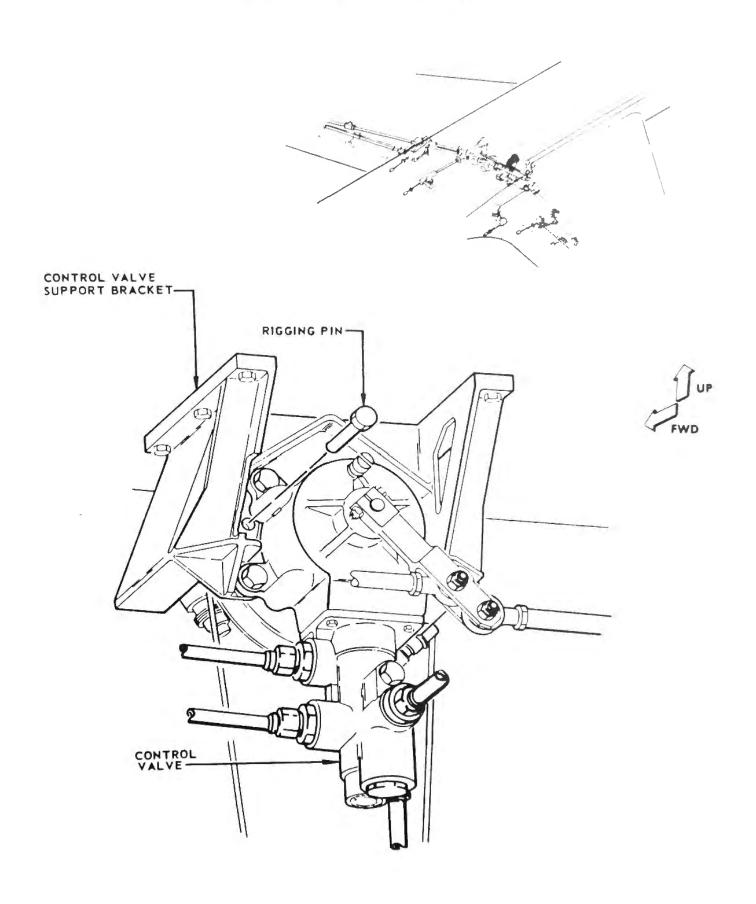






Throttle System Rigging Pin Installation Figure 210 (Sheet 2 of 2)









ENGINE CONTROL DRUM AND SHAFT ASSEMBLY - MAINTENANCE PRACTICES

- 1. Removal/Installation Engine Control Drum and Shaft Assembly.
 - A. General
 - (1) The engine control drum and shaft assemblies for the inboard and outboard engines are identical except for differences in mounting brackets. Therefore, only one procedure for removal/installation is given.
 - (2) No detailed procedure for installing new bearings in the engine control drum and shaft assembly is given; however, during installation of the drum and shaft assembly new bearings may be installed as necessary.
 - B. Equipment and Materials
 - (1) Tensiometer, 0-100 pounds capacity.
 - (2) Leading edge flap lock assemblies F70064-503 or equivalent.
 - (3) Kit-Wrench Engine Control F71435 or equivalent.
 - C. Remove Engine Control Drum and Shaft Assembly.
 - (1) Remove power plant. See Chapter 71, "Power Plant."
 - (2) Remove access panel 3716 or 1739 from nacelle strut. See Chapter 12, "Access Doors and Panels."
 - (3) Clamp thrust levers in idle no load position.
 - (4) Clamp start levers in cutoff no load position.
 - (5) Loosen engine control cables by use of turnbuckles in wing leading edge.
 - (a) For access to turnbuckles in wing leading edge, lower wing leading edge flaps.
 - 1) Pressurize utility hydraulic system.
 - 2) Position flap control lever to "DOWN."





3) Install leading edge flap lock assemblies on flaps Nos. 1, 2, 3 and 4.

NOTE: Access to turnbuckles for inboard engines is under flaps Nos. 1 and 2. Access to turnbuckles for outboard engines is under flaps Nos. 3 and 4.

- (6) Remove supplemental engine fuel shutoff valve linkage from engine start shaft (2). (TWA and AA airplanes.)
- (7) Disconnect upper thrust rod from thrust reverser main valve actuating cam (19).
- (8) Disconnect upper start rod from engine start shaft crank (16).
- (9) Remove lock ring (5) and remove cap nut (7) from upper end of throttle control shaft (8). Use spanner wrench F71435-1 or equivalent.
- (10) Remove throttle drum (6) from throttle control shaft (8).
- (11) Disconnect thrust control cables from throttle drum (6) and tag cables to insure correct replacement.
- (12) Break lockwire and remove throttle shaft plug (18) from lower end of throttle control shaft (8).
- (13) Remove thrust reverser main valve actuating cam (19) from lower end of throttle control shaft (8).
- (14) Remove throttle control shaft lower bearing (20) from throttle control shaft (8) by pushing down with throttle control shaft. Also, remove shaft seal (17).
 - NOTE: The thrust reverser main valve actuating cam stop on the strut bracket may have a clip and shim attached. If this clip interferes with bearing removal, it should be removed.
- (15) Remove throttle control shaft (8) by lowering clear of throttle shaft upper bearing (4) and concentric engine start shaft (2).
- (16) Remove cable guards and remove start control cables from engine start drum (10). Tag cables to insure correct replacement.
- (17) Remove lockring (22) and engine start shaft nut (21) from lower end of engine start shaft (2). Use wrench F71435-2 or equivalent.





- (18) Remove spacer (23) from engine start shaft.
- (19) Remove engine start shaft crank (16) from engine start shaft (2).
- (20) Remove spacer (15) from engine start shaft (2).
- (21) Remove lockwire and engine start nut (14) from strut bracket (13). Use wrench F71435-3 or equivalent.
- (22) Remove lockring (25).

NOTE: Engine start shaft (2) may have to be moved down to remove lockring.

(23) Remove engine start drum retaining nut (9) from engine start shaft (2). Hold retaining nut (9), use spanner wrench F71435-4 or equivalent, and turn start shaft from lower end using spline wrench F71435-5 or equivalent.

CAUTION: INSURE START SHAFT MOVES DOWN AS START DRUM RETAINING NUT LOOSENS. OTHERWISE SUPPORT BRACKET MAY BE DAMAGED.

(24) Remove engine start shaft lower bearing (24) by pushing down with engine start shaft.

NOTE: Removal may require driving bearing from shaft.

(25) Lower engine start shaft (2) until clear of upper support bracket (3) and remove engine start drum (10) and engine start shaft upper bearing (11).

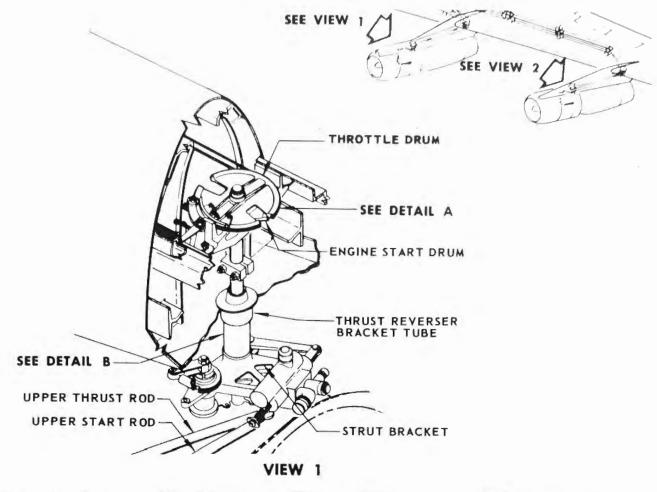
NOTE: If bearing sticks to shaft, move shaft downward and drive bearing from shaft at thrust reverser bracket tube (12).

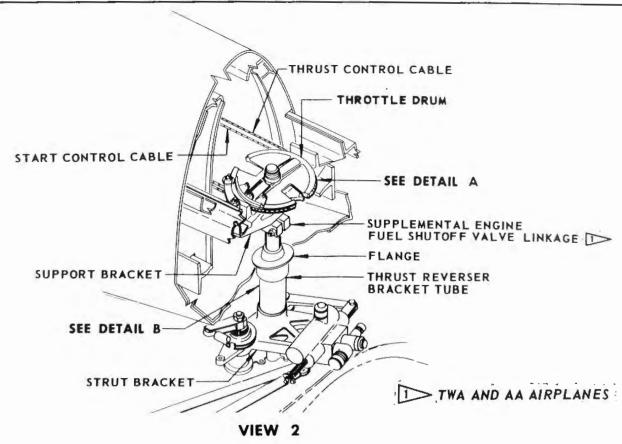
- (26) Remove engine start shaft (2) by lowering through thrust reverser bracket tube (12).
- (27) Remove upper throttle shaft bearing (4) by removing support bracket (3).
- D. Install Engine Control Drum and Shaft Assembly.
 - (1) Install assembly of upper support bracket (3) and upper throttle shaft bearing (4).
 - (2) To facilitate lockring installation mark location of respective lockring holes of start and throttle shafts on engine start and throttle drums and engine start shaft crank.
 - (3) Position engine start shaft (2, figure 201) inside thrust reverser bracket tube (12) leaving upper end of shaft below upper support bracket (3).

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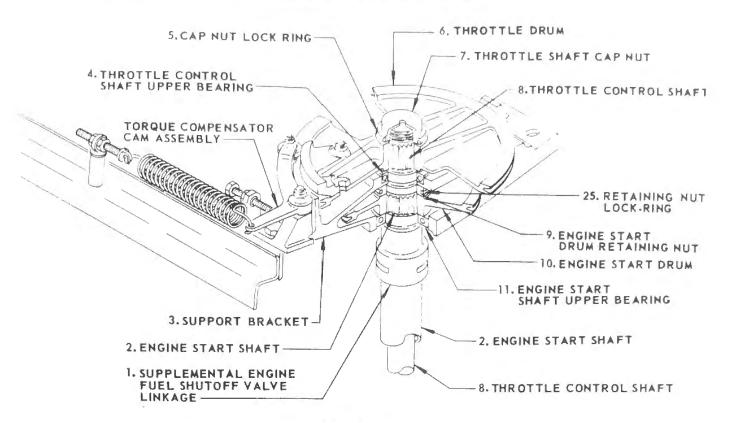
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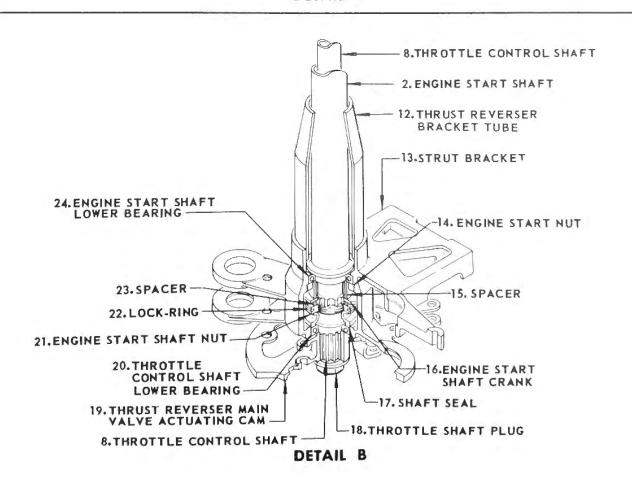
















- (4) Place engine start shaft upper bearing (11) in position on engine start shaft (2).
- (5) Position engine start drum (10) inside upper support bracket (3) and push engine start shaft (2) upward through drum (10) until two threads of shaft show above drum.
- (6) Install engine start drum retaining nut (9) on engine start shaft, torque within 290 to 410 pound-inches, and install lockring (25) on nut. Torque may be increased to 660 pound-inches to align lockring holes. To facilitate lockring installation, hole in shaft may be vertically elongated to 0.15 inch. Apply torque on lower end of start shaft. Use spanner wrench F71435-4 and wrench F71435-5 or equivalent.
- (7) Install engine start shaft lower bearing (24) on engine start shaft.
- (8) Install engine start nut (14) in strut bracket (13), torque within 290 to 410 pound-inches and lockwire. Use wrench F71435-3 or equivalent.
- (9) Position spacer (15) around shaft (2) below lower bearing (24) and install engine start shaft crank (16) on engine start shaft (2).
- (10) Position spacer (23) around shaft (2) below crank (16), install engine start shaft nut (21) on shaft and torque within 290 to 410 pound-inches. Use wrench F71435-2 or equivalent.
- (11) Install lockring (22) on engine start shaft nut (21). Torque may be increased to 660 pound-inches to align lockring holes. To facilitate lockring installation, hole in shaft may be vertically elongated to 0.15 inch.
- (12) Connect start control cables to engine start drum and install cable guards. Remove tags from cables.
- (13) Install throttle control shaft (8) in mounting position by inserting upward through concentric engine start shaft (2) and through upper throttle shaft bearing (4).



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- (14) Connect thrust control cables to throttle drum (6) and remove tags from cables.
- (15) Mount throttle drum (6) on splines on throttle control shaft (8).
- (16) Install throttle shaft cap nut (7) on throttle control shaft (8) and tighten finger tight.
- (17) Install shaft seal (17) on lower end of engine start shaft (2).
- (18) Position throttle control shaft lower bearing (20) around shaft (8) and against shaft seal (17).
- (19) Install thrust reverser main valve actuating cam (19) on throttle control shaft (8).
 - NOTE: New bearings may be installed on cam before installation if desired.
- (20) Install throttle shaft plug (18) on lower end of throttle control shaft (8), torque within 290 to 410 pound-inches.
- (21) Hold throttle shaft cap nut (7) and apply torque at throttle shaft plug (18) on lower end of throttle shaft. Use spanner wrench F71435-1 or equivalent and torque within 290 to 410 pound-inches.
 - NOTE: Insure throttle shaft cap nut clamps throttle drum and does not bottom on throttle shaft. If nut bottoms on shaft cutoff 0.03 inch from upper end of throttle shaft.
- (22) Install lockring (5) on throttle shaft cap nut (7). Torque may be increased to 660 pound-inches to align lockring holes. To facilitate lockring installation, hole in shaft may be vertically elongated to 0.15 inch.
- (23) Lockwire throttle shaft plug (18) at lower end of throttle shaft.
 - NOTE: If clip and shim were removed from thrust reverser main valve actuating cam stop, it should be replaced. Lockwire retaining screw.





- (24) Attach upper start rod to engine start shaft crank (16). Install with adjustable end away from crank.
- (25) Attach upper thrust rod to thrust reverser main valve actuating cam (19). Install with adjustable end away from cam.
- (26) Attach supplemental engine fuel shutoff valve linkage to engine start shaft (2). (TWA and AA airplanes.)
- (27) Insert rigging pin through strut bracket (13) and thrust reverser main valve actuating cam (19).
- (28) Insert rigging pin through engine start shaft crank (16) and strut bracket (13).
- (29) Adjust throttle and start control cables so with thrust levers in idle no load position and start levers in cutoff no load position and respective rigging pins fit freely when the cables are rigged to tension specified in 76-2-0 figure 201A. Measure cable load with tensiometer.
- (30) Remove rigging pins.
- (31) Remove clamps from engine thrust levers.
- (32) Remove clamps from engine start levers.
- (33) Remove leading edge flap lock assemblies.
- (34) Replace power plant. See Chapter 71, "Power Plant."
- (35) Adjust throttle system. Refer to 76-2-0, "Adjust Throttle System."
- (36) Replace access panels. See Chapter 12, "Access Doors and Panels."



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ENGINE CONTROL BELL CRANK ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Engine Control Bell Crank Assembly

A. General

- (1) Two bell crank assemblies are mounted on each engine. Since these assemblies are identical in appearance and operation except for crank arms and supporting structure, therefore, only one procedure for removal/installation is given.
- B. Equipment and Materials
 - (1) Rigging pins are MS20392-4 or AN5 bolts.
- C. Remove Engine Control Bell Crank Assembly.
 - (1) Open engine right cowl panel.
 - (2) Install rigging pin through support bracket and thrust reverser main valve actuating cam on engine control drum and shaft assembly.
 - (3) Install rigging pin through support bracket and engine start crank on engine control drum and shaft assembly.
 - (4) Detach engine start and thrust control rods from bell crank assembly. (See figure 201.)

NOTE: Air ducts may be disconnected as necessary for access.

(5) Release fasteners attaching bell crank assembly to supporting structure and remove bell crank assembly.

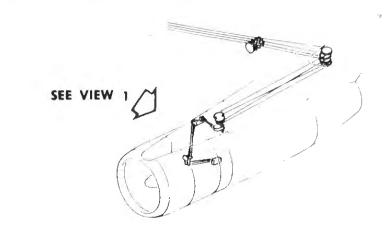
NOTE: Removal of upper bell crank assembly requires disconnecting the right forward engine support link. See Chapter 71, "Power Plant - General."

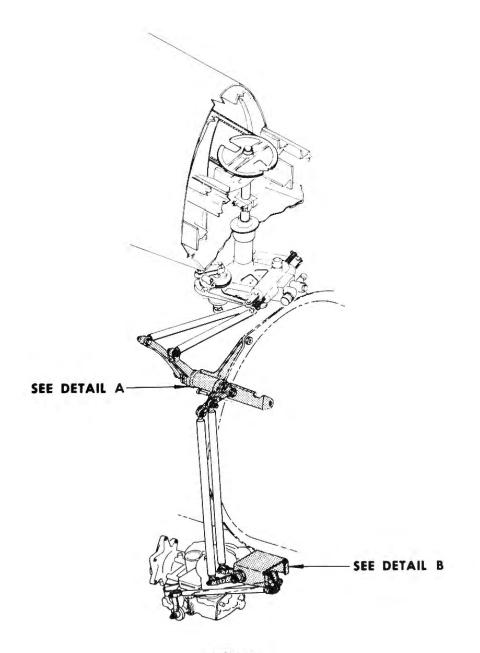
- D. Install Engine Control Bell Crank Assembly.
 - (1) Support bell crank assembly in mounting position and install retaining bolts.

NOTE: For installation of upper bell crank assembly retaining bolts see Chapter 71, "Power Plant - General."

- (2) Connect engine start and thrust control rods to bell crank assembly.
- (3) Remove rigging pins.
- (4) Close engine cowl panel. (See figure 201.)



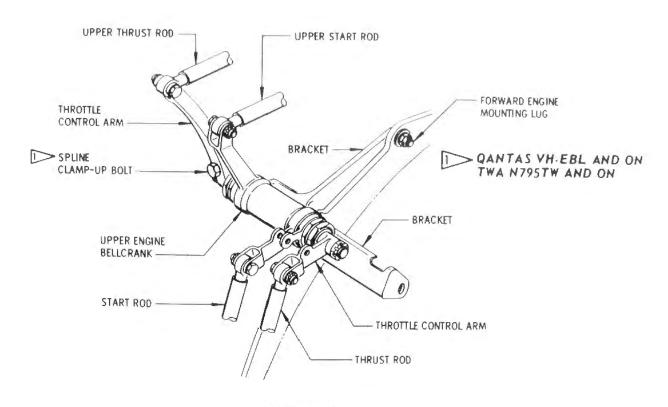




VIEW 1

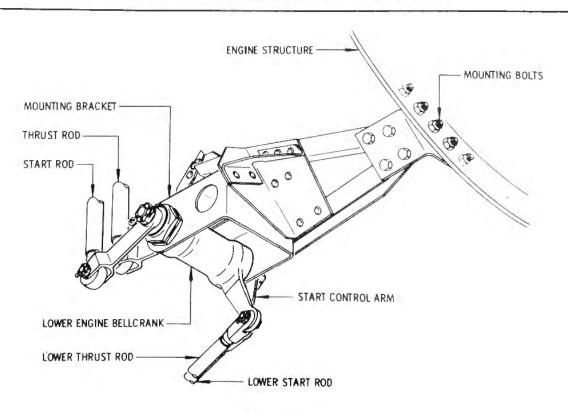






DETAIL A

TYPICAL UPPER ENGINE CONTROL BELL CRANK



DETAIL B
TYPICAL LOWER ENGINE CONTROL BELL CRANK





2. Approved Repairs Engine Control Bell Crunk Assembly

- A. Replace Bearings Engine Control Bell Crank Assembly.
 - (1) Remove bell crank assembly from engine.

NOTE: Upper bell crank assembly may be disassembled without disconnecting bracket from entine.

- (2) Remove retaining nut from each end of bell crank shaft and remove arm from each end of shaft. (See figure 202.) Prior to removing the upper throttle control arm of the upper bell crank, loosen the spline clamp-up bolt on QANTAS VH-EBL and on, and TWA N795TW and on.
- (3) Remove bearing from each end of bell crank shaft and remove shaft.
- (4) Remove retaining nut lock ring and retaining nut from each end of bell crank hub.
- (5) Support bell crank and remove bell crank hub.
- (6) Remove bell crank from mounting bracket.
- (7) Remove bearing from each end of bell crank.
- (8) Install new bearing in each end of bell crank.
- (9) Support bell crank in mounting position inside mounting bracket and hub.
- (10) Install retaining nut on each end of hub.
- (11) Install lock ring in each retaining nut.
- (12) Position bell crank shaft inside hub.
- (13) Install new bearing on each end of shaft.
- (14) Position throttle arm on each end of shaft and install retaining nuts and cotter keys. Do not exceed 410 pound-inches torque on nuts to align cotter pin holes.
- (15) Tighten spline clamp-up bolt on the upper throttle control arm of the upper bell crank on QANTAS VH-EBL and on, and TWA N795TW and on.
- (16) Install bell crank assembly on engine.

TYPICAL UPPER ENGINE CONTROL BELL CRANK

MAINTENANCE

MANUAL

TYPICAL LOWER ENGINE CONTROL BELL CRANK

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